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EDITORIALS

WHAT IS A GAUSS?

Karl Friedrich Gauss was a German mathematician whose activities covered the first half of the nineteenth century. He not only did a great deal of work in studying the magnetic field of the earth, but devised methods of making magnetic measurements. It was very appropriate that when the time came to choose the names for the units in which magnetic quantities should be measured, his name should be honored and perpetuated by applying it to some one of the magnetic units. This was generally appreciated by both scientific men and electrical engineers, but in their eagerness to honor the man confusion has been created by a multiplicity of suggestions.

As early as the International Congress of Electricians which was held at Paris in 1889, the name was proposed for the unit of magnetic induction or flux-density, which was to have a value which should be a decimal multiple of the unit in the system based on the centimeter, gram and second. This suggestion was never adopted. The International Electrical Congress at Chicago in 1893 recommended the use of the C. G. S. magnetic units for practical work, but did not assign any names to these units. In the following year the American Institute of Electrical Engineers adopted names for these units and applied the name "gauss" to the C. G. S. unit of magnetic flux-density. This action was not accepted abroad and in 1895 a committee of the British Association for the Advancement of Science recommended that this name be applied to the unit of magnetomotive force. At the International Electrical Congress held at Paris in 1900 the name "gauss" was recommended for the C. G. S. unit of magnetic field intensity.

The diversity of suggestions and recommendations for the use of the term "gauss" has resulted in a corresponding diversity of usage, so that today one cannot be entirely sure as to what is meant by this term unless it is shown by the context or by definition. In the first edition of the Standardization Rules of the American Institute of Electrical Engineers in which this term was incorporated, the earlier action of the Institute was followed and the name authorized for the unit of magnetic flux-density. This represents the more general practice in this county. It seems unfortunate that in the later editions of these Standardization Rules recognition has been given also to the use of the term for the unit of magnetic field intensity.

Owing to the method of deriving the C. G. S. units, and to the fact that the magnetic permeability of a vacuum has been taken to have the value unity, an impression has been gained by many persons that magnetic field intensity and magnetic flux-density are the same kind of a physical quantity and can consequently be measured in the same unit. This is not really the case, because permeability is not a simple numeric or dimensionless number, but is itself a physical quantity. This has perhaps nowhere been more clearly brought out than by Dr. J. H. Dellinger in a recent publication of the Bureau of Standards entitled "International System of Electric and Magnetic Units." This publication is recommended to the perusal of those desiring further information on this subject or whose ideas are not already clear as to the nature of the quantities here under discussion.

WIRING FOR CONVENIENCE.

Too much emphasis cannot be placed upon the desirability, in wiring any kind of building, but particularly in wiring residences, of providing outlets and switches to meet every requirement which is likely to arise in the future use of the premises. Architects, contractors and owners frequently neglect this matter, to the ultimate dissatisfaction of the person who occupies the building. Each of these classes of individuals takes the responsibility in different cases of deciding what wiring shall be installed, and each in his turn should be familiar with the possibilities of providing for future convenience and with the needs which will be likely to arise as the use of electrical appliances in the home and elsewhere becomes far more general than it is at the present time.

The electrical contractor especially will often find it falling to his lot to suggest an installation for the owner of a building. When he is pretty sure of getting the contract there is every reason for his suggesting the most complete equipment which the opportunity presents, but too often he feels it necessary to plan an installation to meet inadequate cost figures and feels if he does not restrict the installation to the minimum, the contract is likely to go elsewhere. This is an unfortunate state of affairs, as it frequently lies within the power of the contractor to suggest the inclusion of switches and outlets which the owner of the building will later find great additions to his convenience. Enterprising contractors will bring these matters up in any case and endeavor to convince the patron of the value of a complete equipment and the desirability of providing at the outset for all future requirements.

ANSWERING QUESTIONS.

The layman unfamiliar with the operation of an electric utility from either the engineering or commercial side may find many occasions to make inquiries regarding facts and methods involved in that operation. These inquiries may take a wide range, and may have to do with rates, bills, meters, lamps, motors, circuit characteristics, interruptions, extensions, appliances, policies, or any one of a dozen other subjects. They may arise through curiosity, misunderstanding, accident, defective equipment, interest in additional service, mistakes on the part of employees of the utility, desire for knowledge, or perhaps from still other causes. They may be addressed to the manager, the salesman, the cashier, the meter reader, the trouble shooter or any other employee who comes in contact with customers. Whatever the motive and whatever the subject of the inquiry, it should receive a satisfactory answer. This is a fundamental premise for any company seeking to attain the good will of the community in which it operates, and there is no company which can afford to disregard that good will. It is an asset worth cultivating.

To give satisfaction in answering inquiries it is necessary that employees have the desired information, the ability to state it intelligibly, and that they exercise tact and courtesy. Employees who come in contact with the public should be selected with these qualifications in mind. It is not to be expected that every employee will be able to answer every question addressed to him, but when he has not the desired information he should know where to direct the inquirer in order to obtain it. There are certain things which every employee may be expected to know, and they include the things which most customers already know. Among the matters with which employees should be familiar are the voltage and frequency of residence supply circuits, residential rates with provisions for prompt-payment discounts, how to read a meter, practice as to lamp renewals, how lamps are rated, how a bill is made out, the more obvious functions of the different departments of the company, where complaints should be lodged, and whether the company supplies both direct and alternating current.

To the outsider, the employee with whom he comes in contact is the company. It is only through that employee and the service he receives that he knows the company. It would be a fine thing if every customer could meet the manager and have his policies explained to him. In fact, he learns those policies only through advertising and through his contact with employees. And the advertising soon comes to have a hollow sound if it is not borne out by his experience with employees. It is discouraging and disgusting to be met by employees who either cannot or will not try to give satisfaction to customers. Good will is not engendered by such experience. If the employees are to have the right attitude, they must both be trained and be stimulated by the examples of their superiors. Just as children reflect the attitude of their parents, so employees disclose the real attitude of company officials.

LET THE FAN COME INTO ITS OWN.

The summer is over. Our friend the fan, which has enabled us to live in comfort where without it life would have been intolerable or perhaps impossible altogether, has been put away in attic or store room, or left exposed to dust and dirt until it should be needed again.

The pity of it! The fan is not a seasonal appliance, by right, but only by custom, and it is as such that it has come to be looked upon by too many in the electrical industry as well as the layman. Mention the fan and one immediately thinks of the summer, of swelteringly hot days and close balmy nights. This is to be expected, because it is at such times that the fan finds greatest application in the needs of man, by man, for his comfort.

It is not the fault of the fan, but of the user, that it is used only a few months in the year. The fan is as effective for bettering heating as it is for providing cooling, and has the advantage that in so doing it may prove economical. Place the fan against the ordinary radiator in such a way that it draws the cold air against and through the radiator on its way into the room, and the transmission of heat from radiator to air will be increased several times over that existing when gravity alone is relied upon. Try it. Jump out of bed some sharp, chilly morning, close the windows and start the fan going. Then jump back into bed again or retire to the bath room for ten minutes while the fan blows warm comfort out into the room for you, and note the change.

But not only does the fan insure the more intimate mixing of the hot and cold air, in this way making the radiator more effective in creating comfort, but by maintaining a current of air in the room the evaporation from the skin—water vapor and organic matter—will be increased, in this way tending to tone up the body generally and assist in obtaining a healthy heat balance. The amount of air required to make one feel better and warmer and healthier will depend largely upon the temperament of each individual, the temperature and humidity of the air, size of room, etc. As one wants a slight agitation of air rather than its movement at high velocity the fan with two or more speeds is better adapted to this work than a fan with but one speed.

This is not all. The fan is the friend of the house with furnace heat as well as the one with steam or hot water. When a sudden drop in temperature occurs, or when going into a cold room, where there is furnace heat, start the fan going instead of stoking up the fire. If you pay for the coal you will get more comfort and more useful heat from the same amount of coal. And it is easier, anyway, to start a fan than to regulate the furnace fire or the

steam pressure. You can circulate a good many thousand cubic feet of warm air for one kilowatt-hour, but you cannot buy much coal for the cost of one kilowatt-hour. And then it pays to use warm air when you have paid for it!

It is a pity people do not use their fans more than they do. It is surprising that central-station companies do not let this little friend of theirs serve them as it ought. The fan is not a seasonal appliance; it is an all-the-year-round appliance, when it is allowed to be. Let the fan be used in the home and in the office for cooling in the summer and for improving the warming in the winter. Let the merchant place it before his windows to keep the frost and mist away so that passers-by can see his goods. Let the fan carry the smell and odors of cooking away from the kitchen out into the open instead of their being allowed to drift into the house to annoy and nauseate. It requires only a small fan to change an obnoxious place into a place of comfort.

Let the central-station companies boost the fan. Let the retailer and wholesaler boost the fan. Tell the public what the fan can do for them, that they may profit, and in their profiting, profit the industry. Let us all boost the electric fan, all the time. Its use means healthier conditions, greater comfort, and often economy of human effort and coal consumption. The fan is no longer a luxury; it is a necessity. And with the cost of electrical energy ever decreasing it is one of the few, very few, necessities—luxuries if you prefer—that are not costing more today than ever before.

RATES FOR ELECTRIC COOKING.

While the matter of cost is not paramount in the introduction of electric cooking, it is nevertheless a factor which has an important influence in determining the amount of electric cooking which will be done, and the rapidity with which the electrical method of kitchen operation can be introduced. Central stations consequently realize that unless a rate can be made for this service which is considerably less than the prevailing rate for lighting service, there is little prospect for a wide employment of electrical energy for cooking. Special rates have consequently been made for this service in many communities, and but little objection has been made on this score by consumers in other classes. Such objections may arise, however, at any time, and frequent doubts have been expressed as to whether utility commissions would uphold a differential of this kind when a test case came up for hearing.

A decision involving this subject which was made by the Illinois State Public Utilities Commission during the summer will consequently be of some interest. Complaint was made by a power customer that the rates of the Central Illinois Utilities Company were discriminatory and favored the cooking customer as against the power customer. The complaint was dismissed without action, as the Commission held that the charges of discrimination were not sustained. The cooking rate was in this case a block rate, the first ten kilowatt-hours costing 10.5 cents per kilowatt-hour, while the remainder was billed at three cents, both being subject to a discount of one-half cent per kilowatt-hour for prompt payment.

In comparing the two classes of service the Commission held that the power load comes on the daily station peak, whereas the heating and cooking load in Paxton, the town in question, does not occur at the time of either the daily or the yearly station peak. Another factor is that the distribution system can supply the additional cooking load with but slight extensions. This load is therefore more desirable from the standpoint of the utility and can be rendered for a smaller unit cost than a power load which laps the station peak. It was also brought out that in towns of this size it is customary to use the service more largely in the summer months, coal fires being resorted to in winter.

The Commission was careful to state, however, that the decision applied only to this particular case, and was not a general ruling as to the equity of cooking rates in general. The following sentences are significant: "The class of business which these rates aim to secure is a relatively new class of business for electric companies and one which the companies themselves are striving earnestly to develop. The Commission believes that before going into this business extensively and before making large investments in equipment necessary to supply this class of business, and before inducing customers to make a large investment in heating and cooking appliances, the utilities should calmly review the entire situation and determine whether they are able to justify the schedules of rates which are proposed. The utilities can not contend that this is a class of business into which they have been driven since they themselves are developing it and the Commission wishes to emphasize that now is the time to look at this matter from all viewpoints and determine whether the rates proposed can stand up under an investigation which shall take into consideration, not only the costs of rendering the service, but also all other facts which properly influence a schedule of rates."

It is thus evident that utilities must be prepared to justify the rates which they offer for cooking, and make rates for other classes of service that bear a proper relation to this particular schedule. In general a low rate for cooking can be justified, so that there need be no apprehension upon this score. The utility must have gathered the necessary data, however, to demonstrate this in its own particular case. It should also see that other schedules are in fair balance with the cooking schedule. One outcome of the present case was an order requiring the central station to establish an off-peak rate for power service, which, while not necessarily the same as the cooking rate, should take into account the advantages arising from using service only at times other than those of peak load.

Happenings in the Industry

Report of Jovian Convention—Reigning Jupiter Doherty's Message to Jovians—New England Section, N. E. L. A., Meets—Convention of Alabama Light and Traction Association—Indiana Central Stations Plan State-Wide Range Campaign—Central Electric Company Secures New Quarters

ANNUAL CONVENTION OF JOVIAN ORDER IN INDIANAPOLIS.

New Constitution Adopted Which Broadens Scope of Activities and Forecasts New Era in Jovianism Under Leadership of Henry L. Doherty.

The dawn of a new era in Jovianism was ushered in at the fourteenth annual convention of the Jovian Order, held in Indianapolis, October 17 to 20, which has established a permanent claim to fame by the election of Henry L. Doherty as Reigning Jupiter. Throughout the deliberations on the convention floor there was evidenced a seriousness of purpose looking to the utilization, as never before, of the latent power of an organization over 19,000 strong for the good of the electrical industry.

Changes in the constitution intended to widen the scope of the activities of the Order were passed, the most important perhaps being the raising of the annual dues of members from $2.00 to $4.00. Another change which is destined to have far-reaching effect is that providing for the chartering of Jovian Leagues in every community in which there are 15 or more Jovians, the purpose of these Leagues being to actually put into operation locally plans and policies which will be proposed from time to time for the betterment of the industry.

Also, by the provisions of the new constitution, the membership is divided into two different classes, namely, League members and non-League members, depending upon whether or not the member is affiliated with a local League.

Other changes provide for the appointment of a Nominating Committee during each annual convention which is to make selections for the various offices during the year, and present a ticket to be known as the regular ticket for consideration at the annual meeting. Members of the Order can place other candidates in nomination by securing the indorsement of not less than 100 Jovians for each candidate nominated. Another constitutional change provides for the payment of a stipulated salary to Mercury instead of the present arrangement which now is based on a percentage of the dues collected from members.

Opening Session.

Jupiter Thomas A. Wynne, of Indianapolis, called the first meeting to order on Wednesday morning and addressed the convention briefly, reviewing activities of the past year and indorsing the changes in the constitution, which he thought were necessary if the Order was to make the progress which was expected under the leadership of Henry L. Doherty. The meeting was then turned over to Henry Harris, of Pittsburgh, as permanent chairman, who for the past several years has presided at Jovian conventions.

Joseph E. Bell, Mayor of Indianapolis, extended a very cordial welcome to visiting delegates and a fitting response on the behalf of the Order was made by Henry W. Kiel, Mayor of St. Louis.

The annual report of Mercury was then presented, which dealt with the growth in membership, activities during the past year and plans for the future. It was strongly recommended by Mr. Bennett that a committee be appointed to make a thorough investigation of insurance for members of the Order and report at the next annual meeting. Other activities suggested dealt with terms and discounts of electrical material; revision of railroad rates on electrical goods and definite plans for the participation of the Jovian Order in civic work through the various local Leagues.

At the afternoon session on Wednesday addresses were delivered by Fred R. Jenkins, of Chicago, on "Educational Courses of the National Electric Light Association"; by A. D. Curtis, of Chicago, on "Lighting Abroad and Commercial Supremacy"; by M. D. Cooper, of the National Lamp Works, Cleveland, on "Voltage Standardization," and by George B. Muldaur, on "Co-operation with the National Electric Light Association."

Practically the entire day on October 19 was devoted to a discussion of the new constitution, which was presented to the convention by D. L. Gaskill, of Greenville, O. Because of the inclement weather the automobile race arranged for Thursday afternoon was canceled and this time was taken up with a continuation of the discussion on the various changes proposed. An intermission was taken during the afternoon to hear the address of Henry L. Wilson on a subject announced as "Trade Relations with Mexico and Central America."

Address by Mr. Layman.

Friday morning there was a very interesting address by W. A. Layman, president of the Wagner Electric Manufacturing Company, St. Louis, entitled "Building a Career." The message delivered by Mr. Layman was so typical of the new Jovian spirit that a motion was passed that his address be printed and copies be sent to every member of the Order and also that the address be read before every Jovian League. Addresses were also delivered by J. M. Wakeman of the Society for Electrical Development and H. W. Alexander of the same organization. Mr. Wakeman dealt at some length on the practical co-operation which can be undertaken between the Jovian Order and the Society for Electrical Development, as he maintained that there is no confliction between these two and each should depend largely upon the other for carrying out to the fullest extent their purposes.

Mr. Alexander presented some statistics showing the vast amount of business which is yet to be secured by the electrical industry, one particular significant statement being that only 27.2 per cent of all the homes are at present wired for electric light.

Following these addresses Henry L. Doherty, of New York, was introduced and delivered a brief address which is referred to elsewhere in this issue.

Election of Officers.

The election of officers then took place with the following results:

Jupiter, Henry L. Doherty, president of Henry L. Doherty & Company, New York, N. Y.

Mercury, Ell C. Bennett, St. Louis, Mo.

For Members of Congress: First District, Edward F. Hail, Houston, Tex.

Second District, P. S. Klees, Hartford, Conn.

Third District, James R. Pollock, New York, N. Y.

Fourth District, William Gloeckner, Philadelphia, Pa.

Fifth District, W. J. Trott, Grand Rapids, Mich.

Sixth District, C. D. Cabaniss, Atlanta, Ga.

Seventh District, W. A. Burchard, Norfolk, Va.
Eighth District, J. E. Cowles, Shreveport, La.
Ninth District, Martin J. Wolf, St. Louis, Mo.
Tenth District, E. W. Donoho, Chicago, Ill.
Eleventh District, J. I. Colwell, Seattle, Wash.
Twelfth District, John F. Greenwalt, Denver, Colo.
Thirteenth District, Thomas F. Collins, San Francisco, Cal.
Fourteenth District, P. T. Davies, Montreal, P. Q.
Fifteenth District, George L. Guy, Winnipeg, Man.

Statesmen: Alabama, H. W. Matthews, Birmingham; Arkansas, H. C. Couch, Arkadelphia; California, Murray Orrick, San Francisco; Colorado, A. F. Traver, Denver; Connecticut, James T. Hessel, New Haven; Delaware, W. L. Fader, Newark; Florida, H. R. Worthington, Jacksonville; Georgia, Rawson Collier, Atlanta; Idaho, Earnest C. Kiersted, Milner; Illinois, J. S. Corby, Chicago; Indiana, R. Percy Oblinger, Indianapolis; Iowa, B. H. Durbin, Des Moines; Kansas, J. E. Taylor, Kansas City; Kentucky, Paul Tafel, Louisville; Louisiana, W. E. Clement, New Orleans; Maine, T. J. Brown, Boston, Mass.; Maryland, C. Phillips Hill, Washington, D. C.; Massachusetts, M. O. Troy, Schenectady, N. Y.; Michigan, J. A. Cavanaugh, Benton Harbor; Minnesota, O. A. Rofelty, Minneapolis; Mississippi, W. F. Gorenflo, Gulfport; Missouri, A. P. Denton, Kansas City; Nebraska, I. B. Zimman, Omaha; New Hampshire, C. B. Burleigh, Boston, Mass.; New Jersey, Herman C. Heidrich, Newark; New York, H. E. Clelland, New York; North Carolina, A. V. Harrill, Winston-Salem; Ohio, A. M. Wilson, Cincinnati; Oklahoma, H. E. Munson, Oklahoma City; Oregon, A. S. Moody, Portland; Pennsylvania, C. L. Pierce, Pittsburgh; Rhode Island, E. R. Davenport, Providence; South Carolina, W. W. Fuller, Charleston; Tennessee, Frank Flournoy, Memphis; Texas, W. R. Phipps, Galveston; Utah, Leo Brandenburger, Salt Lake City; Vermont, E. E. Larabee, Bennington; Virginia, Guy E. Seiler, Richmond; Washington, Carl Uhden, Spokane; West Virginia, W. R. Powers, Huntington; Wisconsin, Walter B. Crabtree, Milwaukee; Province of Alberta, Norman S. Richards, Calgary; Province of British Columbia, Roy S. Davis, Vancouver; Province of Ontario, J. H. Schumacher, Winnipeg, Man.; Province of Quebec, E. N. Hyde, Montreal.

The annual degree team competition was held Friday afternoon at the Murat Theater and was won by the Chicago team who staged a remarkable exhibition. The team was managed by W. C. Berry, of the Commonwealth Edison Company, Chicago, with R. R. Pilkington as director. The individual prize was also captured by Chicago, this being awarded to H. L. Neill, who portrayed Pluto.

A Message to Jovians from Reigning Jupiter Doherty

I AM not a bit insensible to the honor done me in electing me Jupiter and I hope I will be able to show my appreciation by trying to contribute in some way to the betterment of the Order. I am an organization man and I believe that all of us can do but little if we depend solely on our own efforts. It is the purpose of these organizations to make it possible for everybody to do his share. With the large membership that the Jovian Order now has and the possibility of a still larger membership, a little contribution on the part of every one would do enormously towards furthering any work that we may undertake.

We are indeed fortunate to be in a line of business in which the harder we push the greater good is done for the country as a whole and the people of the country. I have one hobby. You know sometimes the simplest things are the hardest things for other people to comprehend. We all know that co-operation is a good thing, and yet there never was but one man in this country that capitalized co-operation for anything like its full value, and that was J. Pierpont Morgan. Regardless of how much talent he did have or did not have, the fundamental idea of his was to get together, get together, and the result was he made an enormous fortune, not only for himself but for many others. Co-operation was not a lip service with him.

This phrase, "Do it electrically," should not become a mere lip service, but the science of electricity has gone far, far ahead of the application of electricity. We can measure the progress of the world's civilization by the extent we have managed to reduce or eliminate human labor. There has been no one single factor which has been such a wonderful contribution to the elimination of human labor as the development of electricity. I want to get every man in the Jovian Order to thinking of this, that whenever you see a man, woman or child doing any form of human labor, don't forget that that can either be reduced or entirely eliminated if electricity is used as the agent. If you don't know how to do it put it up to somebody that does. Now when we have got that idea thoroughly saturated in every member of the Jovian Order, then we want to saturate the general public with it. Now that all sounds very simple. We have all been saying, "Do it electrically," but that is just lip service compared with actually going out and applying it whenever we see anybody doing any form of human labor.

Men must work and men must play. The man is fortunate who can get his pleasure from his work, and the men who make a big success, as a rule, are men who get pleasure from their work, when the doing of their work is a pleasure.

Every Jovian, I think, should stand for a man who discharges his duties efficiently and well, a man who takes an interest in the entire Jovian Order, and his ideas should be based on the fact that in the development of electricity a pleasure and a good fellowship should go with it. I believe in play, but if I can make my play useful I want to make it useful, and I hope that if this *esprit de corps* can be created in the Jovian Order that no matter how high it is today that it will be still higher, that the fun and the pleasure in the Jovian Order will continue to increase, but that the dignity and the seriousness of the work of the Order will also increase and meet with the universal approbation and respect of the entire electrical fraternity.

NEW ENGLAND SECTION, N. E. L. A. CONVENTION.

Important Discussions on Power Business and Other Commercial Topics Occupy Large Share of Eighth Annual Meeting at Pittsfield, October 17 to 20.

The eighth annual convention of the New England Section, National Electric Light Association, was held at Pittsfield, Mass., October 17-20, with about 450 members and 100 ladies in attendance. For quality of information, and likewise with respect to social features, this was perhaps the most valuable and pleasurable of any gathering held by the Section. The convention headquarters were at the Maplewood Hotel. The General Electric Company, which has a large plant at Pittsfield, and the Pittsfield Electric Company both did much to make the convention enjoyable. The venerable hotel building was beautifully illuminated by means of five searchlights set up on the lawns. Visits were made to the General Electric works, and excursions made to Greylock Mountain and other interesting places in the Berkshires.

The technical sessions began Wednesday morning, with President Walter S. Wyman, Central Maine Power Company, presiding. Hon. Charles H. Wright, of Pittsfield, delivered an address of welcome.

The report of the secretary, Miss O. A. Bursiel, reviewed the year's work, one branch of which is to correct erroneous newspaper reports of fires attributed to defective wiring.

Bowen Tufts, Boston, presented his report as treasurer, stating that the 1915 balance was $793.55; refunds from the N. E. L. A., $4,950; expenditures, $4,925.14; balance, $818.41.

Eugene Carpenter, Newton, Mass., chairman of the Educational Committee, proposed that the National Association be requested to consider the giving of correspondence courses for electrical workers. It has an excellent salesman's training course, and would do well to extend its efforts to all employees. The convention voted to recommend to the N. E. L. A. that it provide such courses. H. T. Sands, Boston, favoring the motion, pointed out that the gas industry has an excellent three-year course for its employees.

The Membership Committee, Willard Hall, Boston, chairman, reported that there are at least 2,400 available prospects for membership in the Section. The A class is almost fully recruited, but B prospects cannot be approached until the national association decides on its dues. The D and E prospects now listed number 392, but there should be at least 1,000 more reported by A members. October 1 the Section membership was 1,193, a gain over the same date, 1915, of 21.9 per cent.

C. R. Hayes, Fitchburg, Mass., for the Question Box Committee, urged a greater use of the N. E. L. A. Bulletin for the procurement of information on vexing questions.

A report of the Advertising and Publicity Committee, by E. S. Mansfield, Boston, outlined work which might profitably be undertaken; advisory service for central stations to arrange advertising campaigns; periodical bulletins describing successful publicity campaigns, with copies of material; standard advertisements dealing with power, light and appliances, ready for use; co-operative publicity with manufacturers; window-display ideas; acting as a clearing house for selling campaign ideas; exhibits of central-station publicity matter at annual conventions; furnishing salesmen's hints and arguments for selling; issuing letters to financial people pointing out the stability of electric securities; the dissemination of publicity regarding Section activities.

Part of the above work will be undertaken at once. A valuable service will be to furnish central stations with window-dressing fixtures consisting of an easel and other appurtenances, and a "show-window calendar" illustrating types of window trims, numbered so that subscribers can order sets of display matter from the Section headquarters.

William Gould, Boston, reported for the Committee on Relations with Kindred Organizations that company sections, municipal inspectors and contractors' interests had been invited to attend the convention, and had participated in monthly electrical luncheons at Boston.

The following officers for 1916-17, reported for the Nominating Committee by H. T. Sands, were elected by unanimous vote: President, Robert W. Rollins, Worcester, Mass.; vice-president, A. B. Lisle, Providence, R. I.; treasurer, Bowen Tufts, Boston; secretary, Miss O. A. Bursiel, Boston; executive committee, by states, A. H. Ford, Portland, Me.; R. D. Smith, Keene, N. H.; E. E. Larrabee, Bennington, Vt.; C. R. Hayes, Fitchburg, Mass.; S. B. Tuell, Pawtucket, R. I.; G. B. Leland, Stamford, Conn.

Session on Large Power Business.

The remainder of the forenoon, and most of the afternoon session were given to consideration of large powers, those presenting papers being W. C. Durant, of the New England Power Company, Worcester, Mass.; Warren B. Lewis, consulting engineer, Providence, R. I.; R. S. Hale, of the Boston Edison Company, and David Elwell, Boston. The last named paper was abstracted in the last issue.

In the paper by Mr. Durant, which was an exhaustive study of comparative power costs with steam and purchased energy, for an actual paper mill now steam-operated with a shaft load of 1,200 horsepower on two engines and an electrical load from a 450-kilowatt turbine, the final comparison shows that $2,300 per year would be saved if electric power were purchased. A further saving of $2,470 per year would accrue if a proposed new mill is electrically driven with purchased power rather than with locally produced steam.

In the discussion that followed, W. H. Snow, New Bedford, a pioneer in low-priced electric power, said the manufacturer at best would make no more than a three-per-cent possible saving, reckoned on his investment, while in his regular business the return would be 10 to 20 per cent. He can, in fact, afford to pay the central station more for purchased power and still make money. Besides being more reliable, especially than private plants with single equipment, central-station service is elastic.

A large mill concern in New Bedford territory planned to build a weave shed calling for 1,000 horsepower, but did not see its way clear to build and also to purchase a power plant. Central-station energy solved the problem.

Central stations are afraid to make rates low enough to attract manufacturers, said Mr. Snow. The former are power experts and have all the advantages of producing power at low cost. Just as it would be impossible for them to go into textile manufacturing and make money, so the manufacturers are not in a position to produce power to best advantage. With each successive accession to the power load, costs will fall rapidly; in fact, it is hard to make a rate so low that generating costs will not drop below it.

The New Bedford Gas & Edison Light Company is now generating about 18 million units; in two years, with the 37,000-kilowatt station now building, its output will be about 60,000,000 kilowatt-hours.

Mr. Snow does not believe in the practice of a service or minimum charge. It angers a customer to pay something for nothing. When a mill is built, the presumption is that it will be run as nearly continuously as possible, and the central station should take a business risk on its supply of power. One contract for 2,800 horsepower and another for 5,000 horsepower, have been made with mills with no guarantee as to the amount of use. In these cases there is no plant on the premises.

R. S. Hale, in a paper on "Demand and Load-Factor Systems for Large Customers," gave the result of an analysis and comparison of several systems. Four central stations submitted on their actual customers.

The various systems are as follows: A—average the four highest half-hour peaks, one on each of four different days in a month, taking highest month of the previous 12; B—average the 150 highest half-hour peaks in the previous 12 months, or pro rata number if customer has been connected a less time; C—take the single highest 15-minute peak in the previous 12 months; D—take the highest 5-minute peak each month by itself; E—take the highest half-hour peak in the period since the annual readjustment of demand; F—take the highest 10-minute peak since the contract started and continue the demand a year, when the demand is readjusted to the highest in the previous two (winter) months, the new demand continuing for a year; G—hourly peaks, before noon and in afternoon, from each month, selecting six peaks on three consecutive days which give highest average, which is the demand for that month and may increase but not decrease during the contract; H—let customer name his demand, and charge him an excess price each time it is exceeded; I—make a trade with customer without measuring demand; J—test the demand by clocking meter or instruments installed a few hours only, and K—various possible systems.

Several independent questions have to be considered—the width of peak, character of load and periods of readjustment.

G. B. Leland, Stamford, Conn., said his company had adopted a demand schedule based on 15-minute peaks, but this had not fitted conditions of a rolling-mill load, in which the 15-minute peak was 486 kilowatts, the one-hour demand peak 240 kilowatts, and the curve-drawing wattmeter had shown a peak of 750 kilowatts, the load-factor being only 15 per cent. He believed manufacturers are unable to produce a satisfactory demand meter until they are told what the central station wishes to determine.

N. J. Neall, Boston, consulting engineer, pointed out that no single form of contract is possible which will apply to all cases, and cited an instance of a mill customer using a device which circumvented the object of the demand-schedule contract.

A member said an elevator is a worse load than a rolling mill. Here even a one-minute peak is not significant; the demand is actual maximum of power used. By procuring actual power requirements by means of a graphic wattmeter a central station could formulate class rates from the data obtained, but too large expense is involved except in the case of very large customers. His company plotted a curve to show the consumption characteristics year by year, by noting monthly demands on cross-section paper by means of dots, afterward connected. This had indicated a fairly close correspondence between demands from year to year.

Another member pointed out that customers are often appalled at complex rate schedules. He believed in the practice of special application of standard rates rather than the establishment of special rates for various classes of business.

The paper of David Elwell was read by E. R. Davenport, Providence, and an interesting discussion followed. E. C. Kimball, of the Boston Edison Company, pointed out that the present time of slow delivery of generating apparatus is an especially good opportunity for securing power business. Prices apparently are not troubling manufacturers who require power. John West, of Charles H. Tenney & Company, Boston, doubted whether either cost or value of service should be the basis for making rates. He pointed out that, just as it had taken time to bring about the motorization of industries, so it will take time to accomplish the next inevitable step, that of substituting central-station service for private plants.

Mr. Hale believed central stations, even small ones, should not be afraid to take on big power loads. J. J. Gillespie, United Shoe Machinery Company engineer, Boston, said there is nothing of greater import in the business world than the development of the central electric station. Industries of all kinds are bound to benefit from the intensive study and propaganda made by central stations. Mill owners will do well to devote their energies to the perfection of processes and the economies of production.

Alabama Light and Traction Association Holds Annual Convention.

An inspection trip to see the electric furnaces at the plant of the Anniston Steel Company and the plant of the Anniston Ordnance Company, together with interesting talks by members of the organization, formed the feature events of the annual convention of the Alabama Light and Traction Association, held at Birmingham, October 16 and 17.

The first day was occupied with registration of about 150 delegates, and, following an address by Theodore Swann, manager of the Anniston Steel Company, a visit was made to the Anniston plants, where many of the delegates saw, for the first time, steel manufactured by electricity and saw the interior of a munitions plant.

President C. C. Henderson made the first address of the second day's session, being followed by H. M. Cohn, of the Birmingham Railway, Light & Power Company; Fred Stines, of the Atmore Light Company; H. H. Shickel, of Montgomery; C. E. Burgess, of Mobile, and Thomas W. Martin, of Birmingham. Mr. Martin discussed the Alabama laws relating to street-railway, light and gas properties.

The election of officers for the ensuing year resulted as follows: President, Thomas W. Martin, Alabama Power Company, Birmingham; vice-president, A. R. Smith, Demopolis Electric Light & Power Company; secretary and treasurer, J. P. Ross, Birmingham Railway, Light & Power Company; executive committee, R. L. Ellis, Selma; J. L. Pevear, Birmingham; C. C. Henderson, Greenville; and T. K. Jackson, Mobile.

Meetings of Lighting Fixture Section, Associated Manufacturers of Electrical Supplies.

The Lighting Fixture Section of the Associated Manufacturers of Electrical Supplies held a regular meeting on October 5, 1916, at the Hotel Biltmore, New York. This Section was organized last May, but owing to the death of Edward A. McCoy, of J. B. McCoy & Son, who was appointed chairman of the Section, little active work has been undertaken up to this time.

At the meeting held on October 5, Walter D. Steele, of the Benjamin Electric Manufacturing Company, Chicago, was appointed chairman of the Section; Herman Plaut, of L. Plaut & Company, New York, being the secretary, and W. H. Jones, of the General Electric Company, Schenectady, N. Y., treasurer.

A special meeting of this Section was held on October 25, 1916, at the Hotel Biltmore, New York, at 2:00 p. m., at which time the new chairman, Mr. Steele, presided and plans were made for activities of the Section along different lines. Committees covering the several divisions of the lighting-fixture industry were appointed. There was a large attendance. The Section embraces in its work street-lighting fixtures, interior-lighting fixtures and industrial-lighting fixtures.

INDIANA ELECTRIC RANGE MEETING HELD AT INDIANAPOLIS.

Plans Discussed and Committee Appointed for State-Wide Campaign.

Central-station companies of Indiana, under the auspices of the Indiana Electric Light Association, have decided to conduct a state-wide electric-range campaign which is to culminate in a comprehensive selling effort to be conducted during the month of May. This activity is the result of a suggestion made by R. A. MacGregor, sales manager of the Merchants Heat & Light Company, of Indianapolis, and was fully described in our issue of September 23, 1916. A preliminary electric range meeting was held in Indianapolis on October 18, at the office of the Merchants Heat & Light Company, to discuss steps for putting the plan into effect. After a discussion which emphasized the benefit which may be expected from such a state-wide movement it was decided to appoint a committee made up of two central-station men, two representatives of electric-range manufacturers to outline a plan of action which, if feasible, will be adopted by all companies who participate in the campaign.

The committee appointed comprises R. A. MacGregor, of Indianapolis, chairman, and R. Thurman, of Muncie, as the central-station representatives and R. B. Wooley, of Toledo, and J. E. Swan, of Chicago, as representatives of the manufacturers. This committee will hold several meetings and report to O. M. Boohrer, of Kokomo, chairman of the New-Business Co-operation Committee of the Indiana Electric Light Association, as soon as some definite plan has been decided upon.

In discussing the prospects, Mr. MacGregor thought that the committee appointed at the Indianapolis meeting should complete all of its work so that the campaign should be inaugurated by January 1 and he confidently expects that there will be at least 1,500 ranges sold in Indiana during the month of May as a direct result of this campaign.

Central Electric Company Buys New Building.

An encouraging development which is, in a measure, indicative of the permanency of the present prosperity in the electrical industry, but more particularly indicative of the growth and progressiveness of the Central Electric Company, of Chicago, is the purchase by officers of that organization of an adjoining building which will enlarge its quarters by fully 60 per cent. This latest acquisition is north of and adjacent to the company's present building at 320 South Fifth Avenue. It is a substantial, attractive structure comprising six floors and basement, having a frontage of 50 feet and a depth of 153 feet. The need for additional quarters has been felt for some time to take care of the rapidly increasing business of the company, but the acquisition of numerous special lines made immediate action imperative. A considerable portion of the new building will be arranged so as to adequately display these new lines and also to properly exhibit many of the other appliances and material, which in the present quarters was practically impossible. In the arrangement of the offices, also, the latest ideas in construction will be adopted, looking to the efficiency and comfort of employees.

The Central Electric Company has been in its present location since 1898, although the building now occupied, 87 feet wide by 153 feet deep, has been built since the fire of 1905 which destroyed the company's original quarters. The new building was purchased as a personal investment by George A. McKinlock, president, and Charles E. Browne, secretary.

Extensive Improvements to Be Made to Merged Dallas Utilities if Franchise is Granted.

During November the proposition of granting the merged electric-lighting and street-railway interests of Dallas, Texas, a franchise will be settled. Charles W. Hobson, president of the Southwest General Electric Company, has obtained a lease on the Oak Cliff street-railway lines and will form a new corporation to take them over, the system to be operated in connection with the Dallas system.

If the valuation basis of $8,500,000 for the electric-lighting and street-railway properties in the city of Dallas, exclusive of the Oak Cliff suburb, is allowed by the City Commission, engineering experts will be secured to make a survey of the entire situation, and upon their report will be made improvements and extensions to the street-railway system, costing $1,000,000, and improvements to the lighting system, costing $2,000,000. Besides these proposed expenditures, the deal which is pending for taking over under lease from the Northern Texas Traction Company the Oak Cliff street-railway lines on a valuation of approximately $2,000,000, there are to be made improvements to these lines, costing about $2,000,000.

The estimated cost of the interurban electric railways which the merged interests are to build has not been made public, and, in fact, has not yet been worked out, as it has not been decided which lines will be constructed out of several projects that are under consideration.

Marconi Wireless Company Enjoined from Infringing De Forest Audion Patents.

On October 12 a perpetual injunction was issued against the Marconi Wireless Telegraph Company of America, prohibiting it from infringing the patents owned by the De Forest Radio Telephone & Telegraph Company, covering the De Forest Audion detector or amplifier. The case came up before Judge Learned Hand, of the District Court of the United States for the Southern District of New York, who issued the injunction. The litigation involved particularly Claims 4 and 6 of patent No. 841,387 for Improvements in Devices for Amplifying Feeble Electrical Currents, issued January 15, 1907; also Claims 2, 3, 6, 14, 18 and 21 of patent No. 879,532, entitled Improvements in Space Telegraphy, and issued on February 18, 1908. Both these patents were found valid and sustained.

The Audion is the wireless detector which permits extraordinary long-distance wireless service, such as between Germany and Sayville, Honolulu and San Francisco, etc. Its use has been licensed by the Atlantic Communication Company, the Federal Telegraph Company and the American Telephone & Telegraph Company. In a statement issued by the De Forest Radio Telephone & Telegraph Company, it is said that: "In view of the complete dependence on the Audion detector for all modern long-distance wireless work, the effect of this injunction on the Marconic company will be far reaching."

American Electric Railway Association Elects Officers at Annual Convention.

The American Electric Railway Association which recently held its annual convention at Atlantic City, N. J., elected the following officers for the ensuing year: President, L. S. Storrs, The Connecticut Company, New Haven, Conn.; first vice-president, T. S. Williams, Brooklyn Rapid Transit System, Brooklyn, N. Y.; second vice-president, John J. Stanley, Cleveland Railways, Cleveland, O.; third vice-president, J. H. Pardee, East Pennsylvania Railways, Pottsville, Pa.; fourth vice-president, Richard McCulloch, United Railways, St. Louis, Mo.

Electricity in Raw-Water Ice-Making

A Discussion of the Electrical Features of Raw-Water Ice Plants With Information and Operating Data on a Number of Successful Installations in Texas Using Central-Station Service

Industrial Power Series—Article No. 179

THE most familiar method of manufacturing artificial ice is from distilled water; however, there have been developed commercial plants for freezing raw water or water that has not been distilled and many of such plants are now in operation. This type of ice lends itself readily to manufacture by electric power, there being no boilers or heat required in the plant.

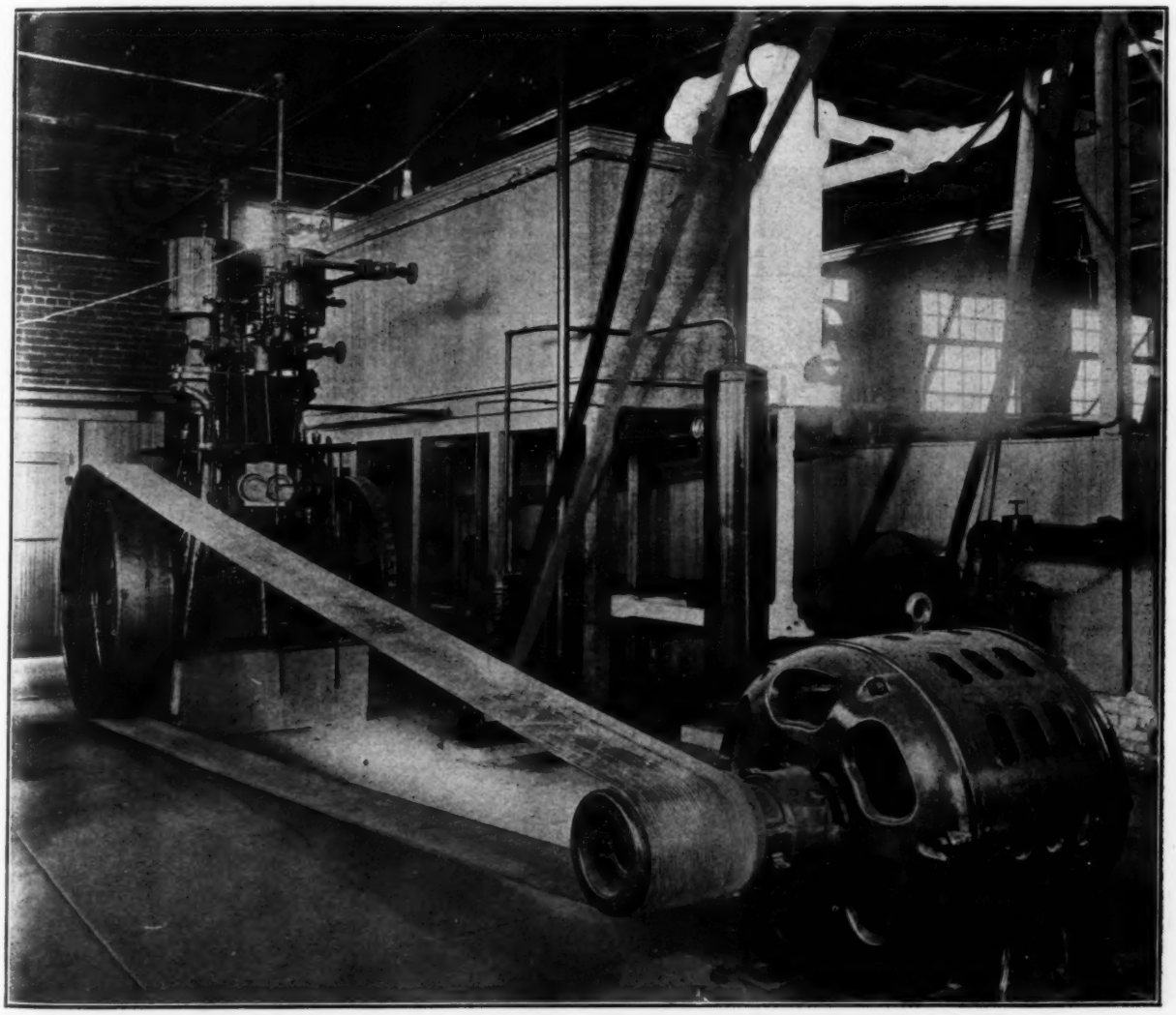
Some waters will not freeze satisfactorily without treatment. The common impurities found are sodium and potassium salts, lime and magnesia. The amount of treatment will vary in nearly all cases. Surface water, such as that from lakes, ponds and rivers, usually requires filtering only, and a small amount of alum and slaked lime for settling. This amount is determined by analysis and by freezing a test can in the plant under consideration.

The Texas Power & Light Company has been doing a considerable amount of work in connection with raw-water ice-making, and is now furnishing power to operate raw-water ice plants at Denison, Tyler and Paris. A great part of the information following has been obtained in connection with the operation of these plants.

In freezing raw-water ice it is necessary to agitate the water with air pressure during the entire time of freezing the block. The pressures used vary with varying conditions from one to five pounds.

When using the low-pressure air, the center, or core, of the block, is sometimes removed when nearly frozen and the space is filled with fresh water. This filling is sometimes made with distilled water, but in some cases the natural or raw water may be used.

This is not necessary with higher pressure air. On account of the foreign matter in the water being driven to the top of the can by this latter method, some plants use a pan on the top of the cake to collect these impurities, the pan being knocked off when the ice is pulled. With higher pressures the power required to produce the



A 10-Ton Compressor Driven by a 50-Horsepower Slip-Ring Motor in a Texas Converted Ice Plant.

air is approximately 20 per cent in excess of low pressure, however, the reduced labor in drawing cores is in favor of the higher pressure.

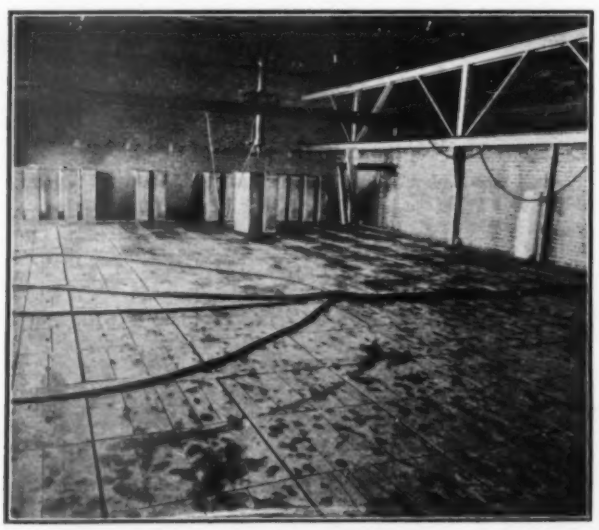
Any existing distilled-water plant can be changed to the raw-water type by piping the tanks for air, and by driving the ammonia compressor and auxiliary pumps with motors. The ice plants at Denison and Tyler were changed from distilled-water plants, while the plant in Paris, originally intended to be driven by the Diesel engine, was installed as a raw-water plant at the time of building and electric motors substituted in the place of the contemplated Diesel engine.

With the distilled water plant the question of securing a sufficient amount of exhaust steam for the can capacity installed was of prime importance, and all motor arrangement tending to economy in power consumption became secondary. With the advent of the raw-water plant using electric drive, economy of operation is the keynote. As a consequence raw-water ice plants can be designed on the basis of economy in power consumption.

In electric operation of ice plants a high load-factor, that is a long operating period, is desired, consequently the best results are secured with small ammonia-compressor capacity, and relatively large storage capacity. This gives minimum first cost of installation and secures minimum cost for electric current, since low rates can usually be secured for long-hour operation.

With only 12 to 14 cans per ton capacity of ammonia compressor, it is necessary to carry very low brine temperature, approximately 10 to 14 degrees, to produce the ice capacity of the plant. This requires 25 to 30 per cent more power per ton than 20-degree brine, which is possible with 18 cans per ton of compressor capacity. Therefore in making raw-water ice the power consumption per ton can be reduced by the addition of can capacity costing approximately $8 per can. This cost includes piping and other expense. The saving in power will pay for the investment in a short time.

Storage capacity is of vital importance, and should be approximately three or more times the daily output for what is called "Day Storage," and 50 to 100 times the daily output for permanent storage. The latter figures

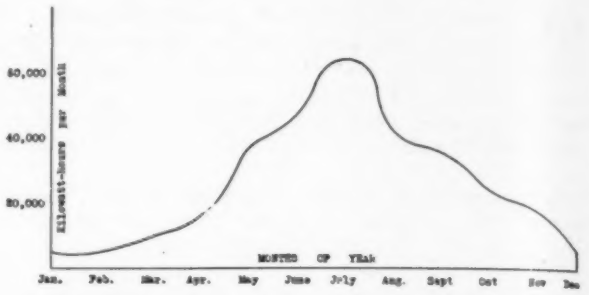


Freezing Tank With Motor-Driven Can Lift.

depend on annual sales. In this way the best operating load-factor can be obtained.

Ordinarily every plant should have at least two compressors, one of small size, approximately one-third of the capacity of the large one. The smaller compressor should be of sufficient size to take care of the storage in case of shut down. It is usually found that existing plants have large-size compressors without enough storage, and are not equipped with a small compressor for maintaining storage temperature. Consequently they are required to operate their large compressor one or two days a week for several months during the year. This, of course, is not economical.

By equipping this large compressor with a constant-speed motor supplied with two or three different size



Curve Showing Variation of Load of Ice Plant By Months.

pulleys the compressor could be operated at varying slow speeds and the difficulties above outlined thus overcome to an extent, at least. Compressor efficiency increases as the speed decreases.

The Paris (Tex.) plant was originally built with one 30-ton ammonia compressor installed. A 10-ton compressor has been purchased and is now in operation. This gives much better operating conditions than could be obtained with the large compressor alone. A large permanent storage house is contemplated. This will better operating conditions.

The following equipment is installed:

No.	Horsepower.	Speed.	Type.	Application.
1	100	490	Slip-Ring	Belted by rope drive to 30-ton Frick compressor.
1	50	490	Slip-Ring	Belted to 10-ton Compressor.
1	35	1,200	Squirrel-Cage	Belted to line shaft driving centrifugal pump, 4.5 by 4 inch air compressor, Connorsville 6 by 10 blower, 4 by 4 core pump, brine agitator and brine pump.

During a complete year's operation 4,490 tons of ice were produced, with a consumption of 318,056 kilowatt-hours, an average of 71 kilowatt-hours per ton. It will be noted from the following table that the kilowatt-hour consumption per ton of ice varies from 52 to 98. This variation is due to operating characteristics, and also temperature variation. Since the small compressor has been installed, the operating conditions have been improved, and no doubt the power consumption per ton of ice manufactured for the next 12 months will be considerably lower.

KILOWATT-HOURS PER TON OF ICE.

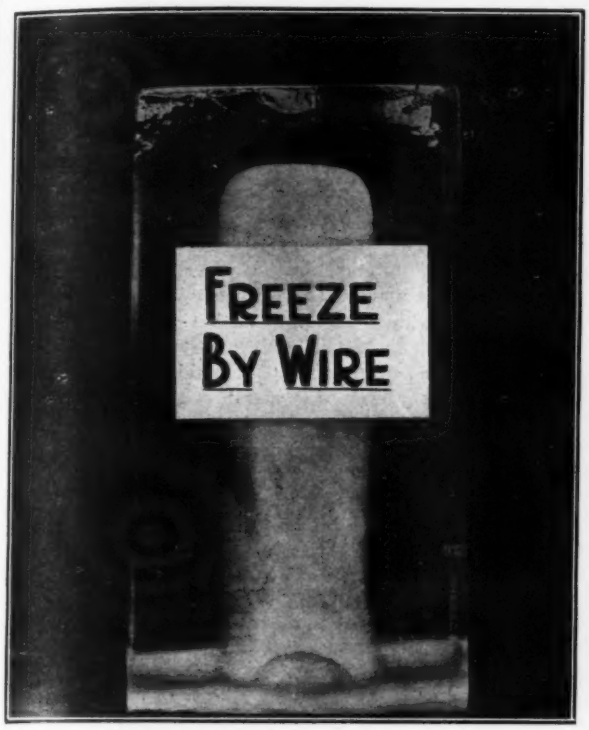
Month.	Tons of Ice.	Kilowatt-hours.	Kilowatt-hours per ton.
January	88	4,990	57
February	66	5,040	76
March	162	9,110	56
April	272	14,130	52
May	594	37,870	64
June	718	44,969	63
July	989	65,873	67
August	540	41,310	77
September	492	37,230	76
October	287	25,530	89
November	210	20,596	98
December	72	6,044	84

Tank capacity is 420 300-pound cans.

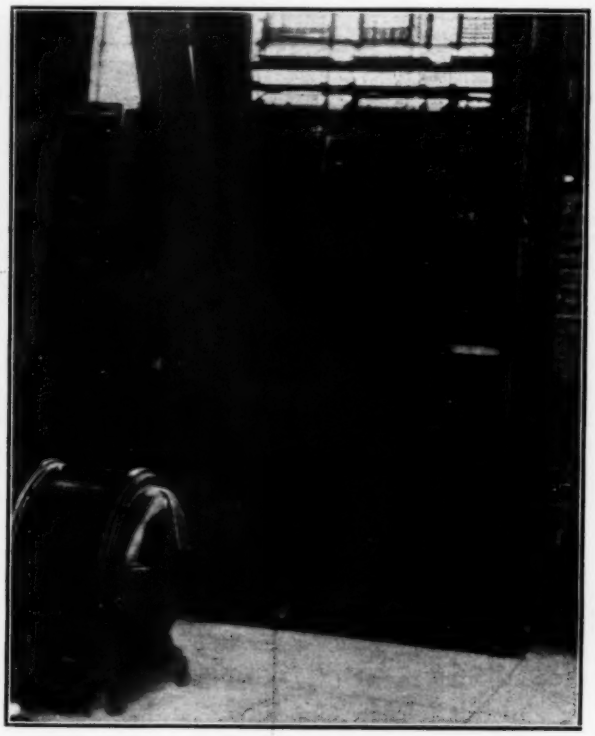
The storage capacity is approximately 1,000 tons.

During a test run of 720 continuous hours using the small compressor, 528 tons of ice were produced with a power consumption of 27,000 kilowatt-hours, making the kilowatt-hours per ton 51.

Each plant is a separate problem, and must be studied as such. In drawing conclusions the above information should be used only as a guide.



A Specimen of Raw-Water Ice Showing a Sign Held Against the Back of the Cake.



A 35-Horsepower Motor Which Operates Auxiliaries In a Texas Raw-Water Plant.

Arrangement of Driving Sheave on Motor Which Operates a 30-Ton Compressor.

30-Ton Compressor Which Is Driven By a 100-Horsepower Motor by Rope Transmission.

THE EFFECT VARIATIONS IN CAN ALLOWANCE HAVE ON HORSEPOWER REQUIRED TO PRODUCE ONE TON OF ICE.

1 No. 300 Lb. Cans Per Ton Ice-Making.	2 Average Brine Temperature Needed to Produce Ice, Degrees Fahrenheit.	3 Rate of Heat Transmission B.t.u. Per Foot Per Hour.	4 Temperature Required in Pipe, Degrees Fahrenheit.	5 Corresponding Suction Pressure, Pounds.	6 Total Brake H.P. Per Ton Ice-Making with 185 Lbs. Head Pressure.
10	7	15	—3.3	13.3	2.77
12	11	15	0.7	16.2	2.56
14	14	15	3.7	18.5	2.45
16	16	15	5.7	20	2.352
18	18	15	7.7	21.7	2.27

NOTE.—Evaporating surface in the freezing tank assumed in this table is 108 square feet or 260 feet of 1.25-inch pipe per ton of ice.

NOTE.—This table is based upon the water to be frozen being delivered to the cooling and freezing system at 70 degrees Fahrenheit.

Work done by cooling system—30 B. t. u. per pound of ice.

Work done by freezing system—200 B. t. u. per pound of ice.

With condensing water at 85 degrees Fahrenheit average, a well-designed raw-water plant should produce ice for 65 kilowatt-hours per ton.

POWER REQUIRED PER TON OF ICE AT DIFFERENT CONDENSING PRESSURES. C. A. COMPRESSORS—20-LB. SUCTION PRESSURE.

Condensing pressure	145	165	185	205	225	245
Horsepower per ton of ice	1.874	2.114	2.352	2.587	2.851	3.098
Per cent power 185 pounds = 100 per cent	80	90	100	110	121	131

Corrected Statement of Decision on Rental of Philadelphia Conduit System.

In the September 30 issue of this publication there appeared an item regarding the decision of the Pennsylvania Public Service Commission on the application of the Philadelphia Electric Company and the Keystone Telephone Company for approval of a proposed lease of telephone conduit system by the electric company. Statements were made concerning the proposed contract for duct space and the protest made by the city against its approval, followed by a statement credited to the Public Service Commission but which was made in an interview by one of the Commissioners.

The official order of the Commission reads as follows: "This matter being before the Public Service Commission of the Commonwealth of Pennsylvania upon application and protest on file, and having been duly heard and submitted by the parties, the Commission, after careful consideration and investigation of the matters and things involved, finds and determines that the approval of said application is not necessary or proper for the service, accommodation, convenience and safety of the public; and it is ordered that the application in this case be and the same is hereby refused."

The Philadelphia Electric Company has joined with the Keystone Telephone Company in asking for a rehearing in the above matter "so that they may have an opportunity of ascertaining the specific objections in the minds of the commissioners to the approval of the proposed lease and of meeting such objections, if possible, by further evidence, argument, or supplemental agreement."

N. E. L. A. Executive Committee Hears Reports of Officers and Section Chairmen.

The executive committee of the National Electric Light Association held a meeting at the New York offices of the Association on October 13. The meeting was concerned chiefly with the reports of officers and of the chairmen of the different Sections of the Association.

Following an abstract of the financial report by Treasurer W. T. Atkins, Secretary T. C. Martin presented the membership report, which showed a total of 15,066 members. Walter Neumuller, chairman of the Membership Committee, reported that an intensive two weeks' campaign for additional members was planned for January.

President H. A. Wagner stated that the Association was now a member of the United States Chamber of Commerce and submitted the names of 10 delegates whose appointment was approved.

Chairman E. A. Edkins, of the Commercial Section, reported that the standing committees are actively at work, and stated that the executive committee of his Section has voted to ask for the appointment of a new committee on compensation of salesmen. Mr. Edkins recommended again the establishment of general information and data files to be available for general use by members of the Association. A general outline of the files planned has been submitted to the Section executive committee for reference to the main executive committee with the recommendation that they be established.

Chairman R. J. McClelland, of the Technical Section, referred to the proposed plan of establishing a committee on engineering service for small companies, stating that investigation showed that the plan would be impracticable. He proposed an information bureau which would fit in with the data files. Mr. McClelland reported that the work of his Section was well organized and that the question of co-operation with various committees of the A. I. E. E. and A. S. M. E. has been taken under advisement.

Chairman J. L. Bailey, of the Accounting Section, in his report advised the institution of two correspondence courses on accounting, one fundamental and the other more advanced. The Section was authorized to proceed at once with the fundamental course and to develop the advanced course.

Chairman E. S. Mansfield, of the Electric Vehicle Section, made a report in which among other matters he stated plans were being made for inducing all Class A members to buy for use or resale at least one electric vehicle.

H. M. Edwards, of the committee on valuation terminology, called attention to the work of other associations on accepted terminology to be used for appraisals of public utility properties, and asked for an appropriation to assist in this work.

E. A. Edkins and R. J. McClelland reported on the study made of Atlantic City as a place for the 1917 convention. Discussion on the desirability of continuing the large conventions followed, after which it was decided that the sub-committee on the place for the next convention visit Pittsburgh at an early date.

Relation Between Chemical Composition and Electrical Resistance.

In a paper presented before the recent meeting of the American Chemical Society, Colin G. Fink described a series of experiments carried out in support of the theory that the electrical conductivity of substances in general is primarily dependent upon the shape and distribution of the fundamental grains or particles composing the substances, and secondly, upon the presence or absence of thin films of secondary material ("cement") enveloping these ultimate grains.

Extremely fine metal powders of various grades of fineness were mixed in equal proportion with very fine insulator powders. These mixtures were compressed into rods, fired at very high temperature and their electrical resistance determined. It was found that although the chemical composition of all the rods was absolutely identical, one set of rods gave extremely high resistance values whereas the other set of rods showed metallic conduction or very low resistance values.

In the first case, the fine metal granules are covered with a thin film of the insulator, whereas in the second case the insulator granules are covered with a thin metal film. On the basis of this theory, the electrical conductivity of many colloids and the electrical resistance of metals containing small traces of impurities is readily accounted for.

The Spring Lake Drainage and Levee District

Substitution of Electric Drive for Engine Drive for Pumping in Illinois Drainage District Proves Very Satisfactory, Especially as Regards Operation Costs and Freedom from Interruption by Using Central-Station Service

THE Spring Lake Drainage and Levee District is located in Tazewell County, Illinois, along the Illinois River, and extends from a point about five miles below Pekin to a point about three miles below the Copperas Creek locks. This district has an area of about 12,500 acres and is 18 miles long, the width varying from one-half to three miles, depending upon the distance from the river to the bluffs. Before the levee was constructed and the drainage system put into operation this land was considerably below the level of the river for the greater part of the year. Now the levee, with its ditches, canals, and pumping plant, makes it possible to remove the water to a level that permits the land to be farmed.

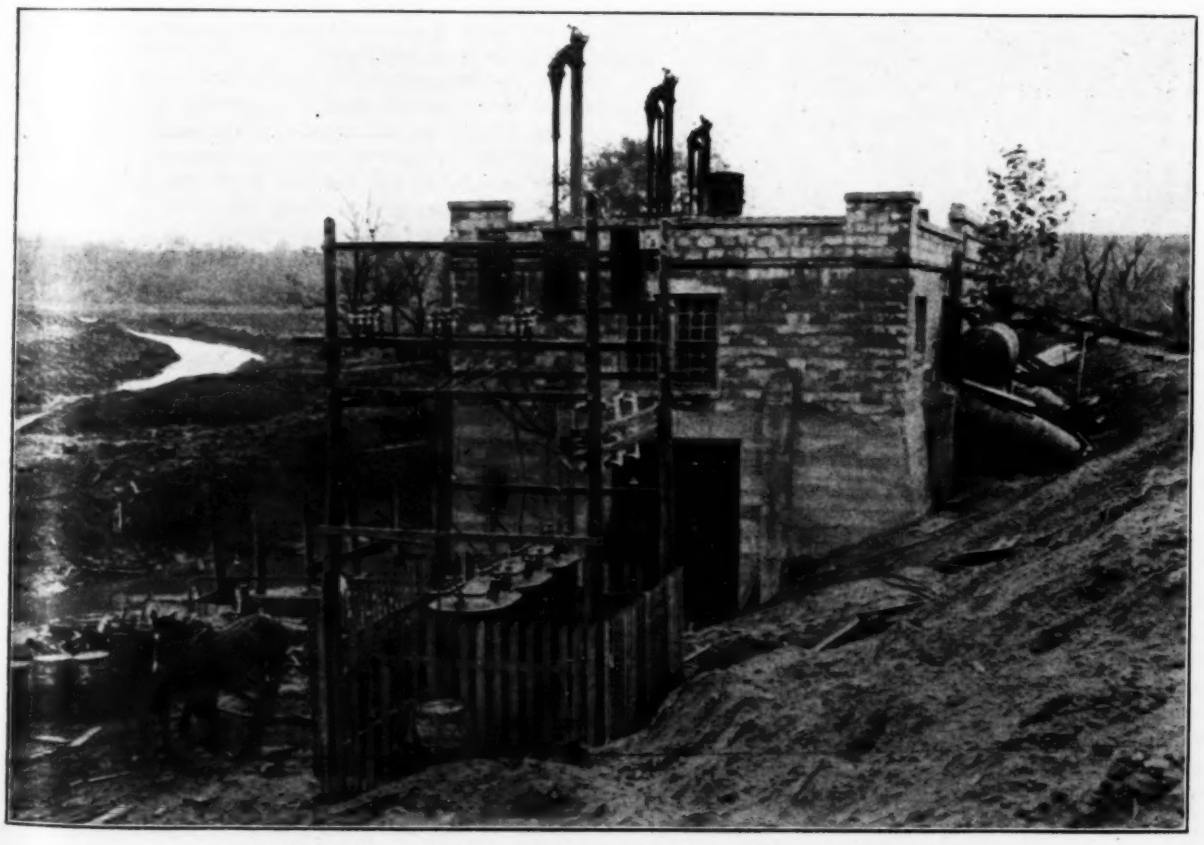
Pumping Plant.

The pumping plant is at the extreme lower end of the district along the river, and is about 15 miles from Canton. Power is furnished by the Canton (Ill.) Gas & Electric Company, over a three-phase, 60-cycle, 13,000-volt transmission line extending from a substation in Canton to Bell's Landing, about three miles above Copperas Locks, and on the opposite side of the river from the pumping plant. From Bell's Landing the wires are carried across the river on four steel towers of the four-post type set on concrete foundations and piers, the bases of the towers being three feet above high-water mark. The total distance spanned in crossing the river is approximately 2,000 feet. From the river crossing the line then extends for about six miles along the levee district to the pumping station. A substation is maintained at the pumping plant. It consists of four 25-foot poles. On these poles are mounted lightning arresters, disconnecting switches, choke coils and fuses. The transformers, each of 200 kilovolt-amperes capacity, 13,000 to 460 volts, are mounted on the concrete base.

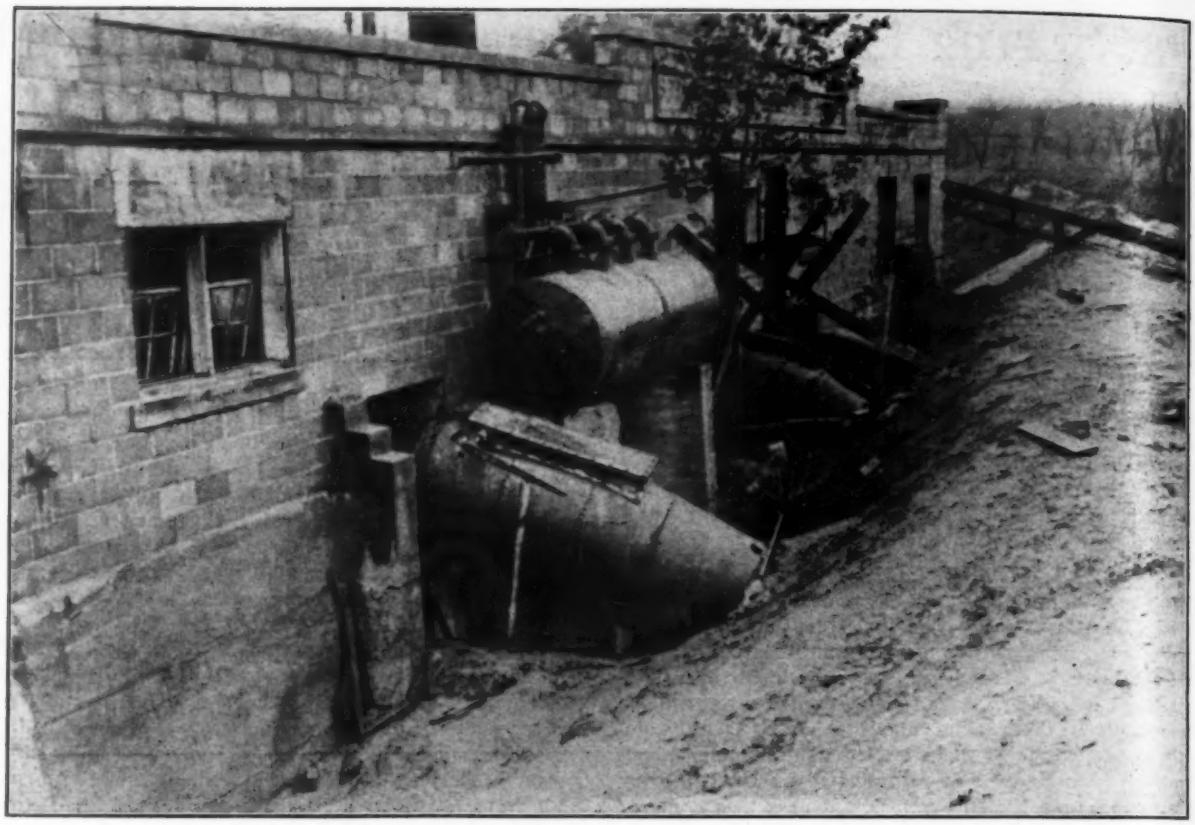
Original Equipment of Plant.

The original equipment of the pumping plant in 1909 consisted of two 48-inch R. D. Wook & Company pumps driven by two cross-compound Russell engines direct-connected, operating at speeds of from 170 to 215 revolutions per minute, and one 24-inch Worthington pump direct-connected to a single-cylinder Russell engine driven at 250 revolutions per minute. The 48-inch pumps each have a capacity of 49,600 gallons per minute and the 24-inch pump has a capacity of 13,000 gallons per minute, making a total capacity of 112,200 gallons per minute for the station, which required an indicated horsepower of from 575 to 750 for operation, depending upon the elevation of the water in the discharge bay. The pumps were primed by means of steam ejectors, and the lighting of the plant was furnished by a small vertical engine directly connected to a direct-current generator. The boiler equipment consisted of two 300-horsepower water-tube boilers with hand-fired grates, the necessary draft being obtained from a steam-driven induced-draft outfit.

Due to the difficulty in obtaining coal, in obtaining and holding good engineers and operators, and to the further difficulty of obtaining repairs in case of emergency, the



Substation and Pumping Plant of the Spring Lake Drainage and Levee District.



Side View of Pumping Plant of Spring Lake Drainage and Levee District.

Commissioners of the District decided to change the plant over from steam to electricity. In 1914 they advertised for electric motors for operating the pumps.

Rates for Central-Station Service.

The preliminary work leading up to the electrification of this pumping plant was done by Hoppin & Rich, engineers and constructors of Peoria, Ill., who made a thorough investigation of the proposed change and the method of making the same for the Canton Gas & Electric Company which is now furnishing the power. At the time of the proposed electrification the Canton Gas & Electric Company had no schedule of rates which could be applied to this class of service. The schedule of rates now in effect in Canton and vicinity applying to drainage and pumping was devised by Hoppin & Rich after a study of existing rates and the cost of power at the company's switchboard. The power is sold at a certain rate per kilowatt-hour per acre per month, the rate depending on the amount of land served and the amount of power used.

The pumping plant as now operated consists of the following equipment: Two 300-horsepower and one 100-horsepower, 440-volt, Westinghouse induction motors with controlling equipment consisting of auto-transformers operating three switchboard-type oil circuit-breakers. The larger motors are connected to the 48-inch pumps by two 25-inch silent-chain belts. The 24-inch pump is driven by a 10-inch chain belt. Sprockets are placed on the pump shafts in the position originally occupied by the flywheel and eccentrics when the plant was steam-driven. A 16-by-8-inch Ingersoll-Rand compressor used as a vacuum pump replaces the steam jets which were used for priming the pumps when operated by steam-engine equipment.

Operation of the Electrically Driven Plant.

The specifications required that the pumps should be operated at two speeds, as the maximum efficiency of the pumps and the motors is obtained with different speeds. By selecting two separate motor sprockets to be fitted to the shaft as the head changes against which the pump must work it is possible to operate the pumps at two different speeds. The lower speed is used when the pump is operating against low heads, and the higher one when the lift is near maximum.

The plant does not operate continuously at its full capacity nor does it operate every day. The pumping depends largely on the season of the year and the amount of rainfall. Heavy pumping is required for only about three months of the year, 65 to 75 per cent of the total yearly work being done from March 15 to June 15. The remaining work is distributed about evenly throughout the other nine months. The usual load on the plant is 250 kilowatts, and during a part of the year this load is on the lines about 10 or 12 hours per day. During the heavy pumping season the motors are sometimes operated from 18 to 20 hours a day. In extremely wet periods all the pumps, taking practically 600 kilowatts, have been operated for a few hours at a time.

The cost of operation has compared favorably with steam operation and the certainty and freedom from interruption have made the service very satisfactory to the Commissioners.

Electrically Operated Marine Railway.

Another installation of interest in connection with this Drainage District is a marine railway which is also electrically operated, and which is located about one-half mile from the pumping station. This marine railway was made necessary by the fact that Spring Lake, which is completely surrounded by the Drainage District, was declared navigable by a recent court decision, and, in order that grain barges and other boats could pass from the Illinois River to the lake, it was necessary to construct locks or some other form of transfer for boats to go over the levee. It was, therefore, decided to install the marine railway for this purpose, which cost about $25,000.

Abstracts of Illuminating Engineering Society Lectures

Street Lighting

By C. F. LACOMBE

STREETS may be classified for street-lighting purposes according to the population of the city and the importance of individual streets. For the most important streets in large cities, the horizontal foot-candles should average 0.5 and the minimum should not be less than 0.25. White ways in smaller cities should average 0.35, with minimum 0.1. Residence streets should average from 0.04 to 0.02, while 0.01 is sufficient for suburban roads. The type of installation selected is usually dependent upon the available funds. High intensity should be provided at important crossings and where there is heavy traffic. In some European cities the values are quite high, reaching 1.4 and 1.75 average foot-candles in important streets of London and Berlin.

Distribution curves were shown for different types of lamp. With large units closely spaced, the distribution of light is not so important as when lamps are far apart. The substitution of several small lamps for one large one breaks up dark areas and gives more uniform illumination. It is, however, best not to have the illumination too nearly uniform, although sudden changes at street crossings should be avoided. The type C Mazda lamp is the most flexible unit available and will no doubt gradually replace the old carbon arc lamps now in use. The magnetite arc lamp has advantages with respect to color and diffusion, but has the disadvantage of being available only in large units and requiring direct current. It is more suitable for the central districts of a city. Where type C lamps are used in the central districts of large cities, multiple circuits may be employed, but elsewhere series circuits with constant current are more suitable. Underground distributon on account of its high cost is ordinarily used only in central districts, but the use of armored cable will reduce the cost. Trolley poles may frequently be used for mounting lamps, thus avoiding the cost of additional poles.

Proper spacing and height of mounting depend upon the nature of traffic, the adjacent buildings and other conditions which should be carefully noted for each individual street. Lamps should be mounted as high as possible under the existing conditions; larger units may well be 25 feet high and smaller units up to 16 feet. Unless lamps are close together the staggering of lamps on opposite sides of the street is preferable to placing them opposite each other. The use of refractors permits increased spacing. Lamps may be made accessible by the use of tower wagons or by means for lowering them to the street. In important streets, iron posts costing from $35 to $125 are generally used. Reinforced-concrete poles have been found serviceable and cheap, some costing as low as $9. It is generally desirable to use brackets on posts in order to bring lamps nearer the center of the street and beyond the foliage of trees, but bracket lengths are limited to about six or eight feet in metropolitan streets.

To avoid glare, diffusing globes may be used and the aim should be to keep sources outside the 25-degree angle. With low mounting it is difficult to avoid glare. The effect of reflections from the road surfaces and from buildings is to increase the intensity of illumination and especially the ability to see by means of silhouette.

Contracts for street lighting should fully specify the service to be supplied and the cost thereof, and should be flexible enough to permit increase in the number of lamps and changes in the type. Specifications should include the following: indemnification of the city against any claims for the use of patented articles; the location and equipment of units and the nature of the supply; details of the conditions of operation and maintenance; limitations as to extensions from present territory; deductions for outages; how testing should be done; the arbitration of disputes and interpretation of contract. A survey of contracts in over 100 cities shows a state of looseness in drawing up contracts, such as would lead to numerous disputes in the case of private business. Photometric tests should be made and inspection provided for. The state control of utilities has had an important effect on street-lighting contracts and rates. As it tends to eliminate competition there is less need for long-term contracts and rates are largely based upon cost of service. Wisconsin has provided for an indeterminate contract which has many advantages. There is a tendency toward lower rates and higher intensities, and the latter is very much needed in most communities.

Building Exterior, Exposition and Pageant Lighting

By W. D'A. RYAN*

BOTH arc and incandescent lamps may be used in the exterior lighting of buildings. Notable examples of exterior illumination are Niagara Falls, the Hudson-Fulton Celebration in New York City and the Panama-Pacific International Exposition. Lantern slides illustrating these were shown. The exposition lighting has led to a large use of flood lighting for other buildings. It is now recognized that in exterior illumination the greater point is to throw the light upon the object to be illuminated, while the light sources are hidden from view. Flood lighting is also effective for pageants.

*Presented by H. B. Mahan.

Abstracts of Illuminating Engineering Society Lectures

The Lighting of Schools, Auditoriums and Libraries

By F. A. VAUGHN

IN buildings of this character the lighting must be artistic and harmonious as well as useful, and vision must be conserved. The psychological effect should be such as to induce study, attention or other suitable mood upon the part of the observer. The designer must have in mind the following aims: sufficient illumination, the prevention of undue brightness, the elimination of glare, proper diffusion, low cost, economy of operation, simplicity and esthetic effects. Architect and engineer must co-operate to secure these. In auditoriums and also in many churches the intensity should be under control. Gothic churches usually require low intensities. In Christian Science auditoriums high intensities are usually desired. The selection of a system and type of design usually form a more difficult problem than the choice of fixtures.

For school lighting, a committee of the Society has prepared a code which is about ready now. Among the necessary elements are the proper location of the light sources, the avoidance of glare, the provision of window shades. The minimum intensity of illumination in class rooms should be four foot-candles and in halls 0.5 foot-candle. The daylight illumination should be from the left. Skylights are often desirable, but usually incompatible with architectural considerations.

Sufficient illumination can be supplied from any of the usual systems. Diffusion is better with the indirect system, but control is better with the direct system. The semi-direct system has some of the advantages and disadvantages of both. It may be advisable if the brightness is kept down so that contrasts in the field of vision do not exceed the ratio of 20 to 1. Uniformity of illumination in the rooms should be within four to one. Walls should have a mat surface and ceilings should be more nearly white than the walls. Glare should be eliminated by screening sources, using diffused light and mat surfaces.

In libraries, if localized lighting is used at all, it should be free from glare. The treatment of auditoriums will depend upon whether they are to be used as churches, lodge halls or theaters. Examples of good lighting of each were given.

The Lighting of Streets

By PRESTON S. MILLAR

THE uses of street lighting are to get protection from criminals, safety for traffic, recognition of persons and decorative effects. Before an installation can be properly designed, the purposes to be served must be recognized. A city is judged by the impressions which it gives regardless of actual conditions, and street lighting is a large element in making a favorable impression. When compared with other municipal improvements its cost is insignificant compared to its value. A striking development of the present time is the use of small lamps for highway lighting in rural districts.

The principal illuminants for street lighting are the gas-filled incandescent lamp, flame and magnetite arc lamps, the gas mantle and the gasoline mantle. Units which throw all the light below the horizontal should not be used in main business streets, but only in residence and outlying streets. The distribution from the unit must be considered in making calculations for street lighting, and models and curves were shown for illustrating this. The individual needs of different types of streets must be kept in mind. On important streets the intensity should average one foot-candle; on streets of secondary importance 0.1 to 0.2; on residence streets 0.05 to 0.1; on suburban roadways 0.02 to 0.04; on suburban streets 0.01 to 0.02. It is on the less important streets that the problems peculiar to street lighting arise. Discernment may be by direct illumination or by the silhouette effect. The proper direction of incident light is important in discerning holes and irregularities of street surface.

The bowl refractor and the diffusing globe give the extremes of distribution. The bowl refractor does not utilize any more of the light, but delivers it in zones below the horizontal. It is better for outlying streets, but not so good where building fronts are to be illuminated. It gives greater glare than the diffusing globe. The latter gives less uniform illumination in contrast to a larger number of small units. General practice is to avoid the latter and use larger units with longer spacing. This gives more contrast and better seeing quality. Where street surfaces become polished by automobile traffic, the brightness as seen by a chauffeur may vary not more than in ratio of 3:1 where the normal brightness varies as 40:1. This is due to the specular reflection which is important in seeing by silhouette.

Tests of street lighting are of two kinds. One involves checks upon meeting contract requirements, and is most easily made by measuring the total flux of light, using a portable spherical photometer. The other is as to the relative merits of different types of installation. This is best carried out by installing a sample of each. The best test for the effectiveness of the street lighting is an actual trial of its revealing power.

COMMERCIAL PRACTICE

New-Business Methods, Policies, Rates and Kindred Central-Station Matters for the Man Engaged in Selling Electricity

LAMP DELIVERY BY PARCEL POST.

Rochester Railway & Light Company Effects Marked Saving Over Wagon Delivery.

The Rochester (N. Y.) Railway & Light Company was one of the first companies on record to adopt the system of delivering incandescent lamps to its customers by parcel post, the first lamps having been delivered in this manner on July 1, 1915. The experiences of the company, according to H. C. Marquardt, have been exceptionally satisfactory as the cost of delivery per lamp has been decidedly reduced over the former methods in use.

All orders for lamps are checked, packed and delivered to the postoffice the same day received so that the customer receives the shipment on the following day. By using precancelled stamps any packages received at the postoffice before 9:00 a. m. are delivered the same day. In order to obtain the privilege of using precancelled stamps, an application blank must be filled out at the postoffice, and then forwarded by the postmaster to the proper department in Washington for approval. The approval is not difficult to secure if the reasons for desiring it are strong enough. The elimination of all unnecessary handling, pounding during cancellation, shaking and jarring during sorting, are reasons that speak in favor of the precancelled stamps.

The Rochester Railway & Light Company delivered 26,000 lamps by parcel post during the first four months. In the first few weeks about 20 lamps were broken. This, upon investigation, showed carelessness in packing rather than in handling during transit, and since that time there has been little or no breakage. Even during the last Christmas holiday season with the usual rush at the postoffice, reports show prompt deliveries, and no complaints from customers of failure to receive lamps. The only breakage recorded was one lamp for this period, while an average of 500 lamps a day were being delivered.

The method of packing at first, was to inclose the cartons as received from the lamp factory in single-backed corrugated cardboard for reinforcement, and then to wrap with the usual strong wrapping paper and tie with a stout twine. Now, however, the company uses a heavy corrugated carton in a range of two sizes, (3 by 6 by 11⅞ inches, 6 by 6 by 11⅞ inches), which require only tying with a strong twine, and the pasting on the address in the form of a sticker which is part of the original order blank upon which the order for lamps is taken. These cartons did cost about two cents each, but are cheaper and quicker than the less expensive cardboard which had to be cut and fitted on each package before the package was wrapped with paper and tied. Recent quotations on corrugated boxes show an increase of over 100 per cent with the possibility of going still higher. As a result, the company may have to resort to the old method of packing in order to keep the cost of delivery within reason. The total cost per lamp delivered over a period of time, averages about one and one-half cents. The postage represents approximately one-half of this, and the remaining half is divided between packing, material and labor.

The average total cost per package is about 10 cents, and each package contains an approximate average of 11 lamps. This round figure of $0.015 a lamp for delivery was formerly exceeded by automobile expense alone, without figuring in the wages of the operators, which gives some idea of the economy effected by the change.

Commonwealth Edison Advertisement Calls Attention to Decreasing Energy Cost.

The accompanying illustration shows an advertisement of the Commonwealth Edison Company, of Chicago, which was published in the daily papers during the week ending October 21, the latter day being the thirty-seventh anniversary of the invention of the incandescent lamp by Thomas Edison. As will be noted, the company took this

EDISON DAY-OCT. 21
On October 21st—thirty-seven years ago—
Thos. A. Edison invented the incandescent Electric Lamp.
Many important changes have been made since then, but none more important from the user's standpoint than the steady improvement of the old carbon lamp down to the present high efficiency Nitrogen Mazda Lamp—which gives three times as much light from the same amount of Electricity consumed.
Electric Light Rates Reduced by Commonwealth Edison Company 70% in Past 20 Years
While the Electric Lamp has been improved so as to give more light, and of more daylight quality, the cost of Electricity in Chicago has steadily decreased—70% during the past decade—so that today our patrons obtain five times as much Electric Light for a dollar as they received ten years ago.
Better Lighting—Better Business
The first step toward increasing trade is to improve the store lighting. Our new Semi-direct Lighting Fixtures, equipped with high efficiency Nitrogen Mazda Lamps, make the store more brilliant, thereby attracting more customers.
On Time Payments
$5 at time of purchase and $1 a month for eleven months secures the fixture—complete, ready to hang. Gives a generous, even, illumination—no harsh glare—no shadows.
'Phone Randolph 1280
Illuminating Engineering Division, Contract Department, for Details
Commonwealth Edison Company
Edison Building, 72 West Adams Street

Significant Advertisement of the Commonwealth Edison Company, Chicago, Published During Edison Week.

opportunity to call attention to the continual decrease in rates for electricity, in the case of Chicago this amounting to a 70-per-cent reduction during the past 20 years.

It is indeed an excellent idea to keep before the public, by appropriate announcements at every opportunity, how economical electric lighting has become.

LIGHTING COMPANY IN LOWELL ENLARGES APPLIANCE DEPARTMENT.

Stock of Repair Parts for Various Appliances Carried—Electric Ranges Featured in Campaign.

The Lowell (Mass.) Electric Light Corporation has taken up a more systematic and aggressive handling of electrical appliances since occupying its new location on Market Street. In its former quarters there was little room for any pretentious display of the larger wares, and the appliance department was not a conspicuous feature of the business. Now that the company has a commodious first-floor office and show room, the business is being enlarged and a complete line of all domestic cooking, heating, laundry and other appliances, together with an attractive line of lamps, is being carried.

As a preliminary to the general introduction of electric ranges, eight ranges have been sold to representative families in three of the best residential sections of the city.

These were sold without profit but with the understanding that the purchasers' names could be used in further soliciting and that the homes could be visited and the equipment inspected by persons interested. It is also understood that the purchasers will use the ranges regularly.

The ranges sold thus far are all of the larger types, being of three-burner tops or larger, it being the company's object to put the electric cooking business on an all-the-year basis rather than have the equipment used as auxiliary or for summer only.

Laundry equipment, particularly washing machines, are being featured at the present time. The department purchases eight or ten at an order, and the stock is being moved with facility. Extra motors for washers are kept on hand, so that any breakdown can be replaced at once without allowing the apparatus to lie idle, with the resulting disappointment and grievance of the housewife. The head of the sales department, Charles W. Halstead, believes that there is nothing which so "peeves" a housewife as a "dead" household appliance, and he is determined that no occasion shall be given for such a condition. Extra burners are also carried to be supplied to ranges when those already installed fail, and extra motors and parts are kept for vacuum cleaners, though it is the practice to give another machine in exchange when one held by a customer gives out. Only one make of cleaner is carried, this facilitating the renewal plan, in that only one kind of parts needs to be carried.

The same practice prevails with respect to flatirons. When a customer brings one in in a disabled condition, he or she is given another iron that is in perfect working order. This does not involve giving a new appliance for a used one; it is simply a plan for exchanging used units and keeping them out on the lines, thus preventing interruption in their use and also in their current consumption.

A two-cent secondary heating and cooking rate is in effect in the Lowell central station's territory.

Political Debate on Motograph Sign Staged by Merchants Heat & Light Company.

A characteristic activity of the Merchants Heat & Light Company, of Indianapolis, which is indicative of the progressiveness of R. A. MacGregor, sales manager, in taking advantage of every situation that will focus favorable attention on the company, is the political debate that is being "flashed" on the company's motograph sign.

As already announced in these columns, the company has established new quarters in the business center of the city, known as the "Daylight Corner," because of the brilliant exterior lighting of the building. A crowning feature of the electrical illumination is a motograph sign installed on the roof on two sides of the building. Announcements made by this sign have dealt largely with company slogans and notices, but because of the intense interest in the presidential campaign in Indianapolis it was decided that a political debate, in which all factions were represented would be a much appreciated novelty.

Accordingly Meredith Nicholson, George Ade and Mrs. Nicholson were each prevailed upon to write their views on the political situation, in not more than 45 words, which would be flashed to the citizens by means of the sign. Mr. Nicholson discusses the Democratic claims, Mr. Ade the Republican and the suffrage plea is voiced by Mrs. Nicholson. Each message is run every night for one week, the plan being to conclude the debate on the night before election.

Much favorable comment has been received by the Merchants company, not only from the thousands who have viewed the spectacle, but also from many newspapers.

Lighting Celebration in Minneapolis Draws Crowd of 50,000.

On the night of October 18, 103 ornamental standards, installed in an outlying business section of Minneapolis, Minn., known as New Boston, were lighted for the first time. The occasion was made the basis for a civic celebration, in which at least 50,000 people participated. The lighting installation is, of course, incidental. The outstanding feature is that 50,000 inhabitants of a city—customers and prospects of the central-station company—joined in a celebration that had for its main purpose the popularizing of electricity and the fostering of good will towards the utility.

H. E. Young, the energetic sales manager of the Minneapolis General Electric Company, was largely responsible for the notable results achieved. He is a strong advocate of the participation by utility companies in all civic and community movements which have for their aim the upbuilding of the community, and the success of his efforts in Minneapolis may be attributed largely to this attitude.

The standards installed in New Boston are of the same type as used throughout Minneapolis. They are installed by the central station for various merchants' associations or individual houses on the basis of $45 per year per post, or when desired, the cost is pro rated among a number of business houses.

Baltimore Company to Occupy New Building.

The Consolidated Gas, Electric Light & Power Company of Baltimore expects to move into its new office building at the corner of Lexington and Liberty Streets about November 15. The building is 20 stories high, of steel and white-marble construction, and is the most modern office building in the city. One of the features of the building will be retail stores in the corridors of the upper floors for handling various classes of merchandise.

The Consolidated company expects to use about 30 per cent of the building for its own offices and will also use the space on the ground floor for the display of electric and gas fixtures and appliances of all kinds. The balance of the building will be rented out to different concerns for office space, preference being given to concerns connected with the electric or gas industries.

"Wireless" Catch-Line Used in Haverhill House-Wiring Advertisement.

A forceful advertisement, which pointed out that "wireless" as applied to homes has a very different significance than when applied to a system of communication, was recently displayed in local newspapers by the Haverhill (Mass.) Electric Company. The "wireless" house, it points out, is anything but up-to-date, and the present is a good time for the householder to have his home wired to give his family the many benefits of electric service.

VALUE OF NEW-BUSINESS DEPARTMENT SHOWN.

Likened to Spark Plug of Automobile by C. B. Hart, of Fort Wayne.

Speaking before a recent convention of Indiana central-station representatives, C. B. Hart, of the Fort Wayne & Northern Indiana Traction Company, pointed out in an interesting manner just what the relation of the new-business department to the other departments of a central station is and how there should be absolute harmony.

"The heads of departments in our company," he said, "constitute a composite merchant, trying to sell electricity on a fair and square basis, and to keep the customer coming back for more. This composite merchant of our company plans and schemes to add more customers and to maintain a splendid service, just as all merchants do in their line of business. But what good are plans and schemes if they are not executed with skill and intelligence by the workers whose duty it is to carry them out? So each man should feel that in order to sell current on a square basis, his work must be done correctly and with interest.

"The accounting department, which in many localities does not come in direct contact with the public, should realize that a great part of the business on the books represents some effort on the part of the sales force, and should be careful to do their share toward maintaining pleasant relations between the consumer and the company. Much has been said about credit and collection departments. Probably no other department in the organization can deal a greater injury to the work of the sales department unless those employed for this duty have the ability to analyze character, be courteous and tactful, have a knowledge of business principles and have courage and determination to be successful in their work. I have not the least doubt that this particular department could be the means of losing thousands of dollars worth of business annually if it is not made up of individuals having the proper qualifications.

"The construction and repair department can assist the sales department very materially by taking pride in doing good work quickly, with the least possible annoyance to the customer. Just as soon as the salesman hears of the service being off at some place or another, he realizes that all his argument for his company's excellent service is shot full of holes, unless service is restored quickly. Even in a great many cases where inside trouble arises on account of poor wiring, etc., for which the company is in no wise at fault, the speedier we restore normal service the greater regard the consumer has for this part of our organization, and the salesman's efforts and prospects are not seriously impaired.

"Our meter readers are the weighers of our product, and on them rests the responsibility of dealing out the correct number of units for the money. The efficient meter reader is not the man who makes 200 calls and has 30 mistakes, but rather the man who makes 100 calls and a perfect score. There has been many a customer lost through an over-read meter, and, while, of course, mistakes can be patched up, it takes valuable time, and has a tendency to make a customer suspicious for a long time.

"The customer should not be inconvenienced in any way when seeking or asking for information, and while a man may be perfectly right in saying that his department does not handle the work referred to, yet it is difficult for a customer to understand that all business connected with the company is not your own business. In such cases a memorandum should be made and the customer told that the inquiry will be taken care of at once. Then the query should be turned over to the proper department to be handled.

"The introduction of a sales and new-business department in central-station work was brought about by the logical reason that the amount of business on our books can be tripled by going after it, instead of pursuing the old method of sitting back and waiting for it to come of its own accord. The first move in the organization of a new-business department is the selection and education of those to be employed in it. The salesman should be naturally endowed with characteristics, such as pleasing personality, knowledge of the business, enthusiasm, etc., but I am inclined to think the main thing to do is to get him to feel that he is in this business for himself. Let him take the attitude that here in this great growing industry is opportunity enough for him. And let him make the manly boast within himself that he is man enough to grow great with this opportunity, to be a big success in this, his business.

"Every citizen in the community is a customer or a prospective customer. Sincerity on the part of the electrical company is the first step. The salesman must gain the prospect's confidence, and this can only be done if the salesman knows that he is selling the right goods at the right price. Electrical appliances will not sell themselves. In entering the merchandising field, it is well for the industry to copy the work of the up-to-date department stores and give prompt and satisfactory service. Careful analysis is a preliminary step to establishment of service of this modern type, and then a set of rules is involved for guidance. The central-station company should take advantage of every opportunity to educate its employees. Sales people should, above all, understand that the company's policy is to satisfy, and hence they should know the practical operating facts about the appliances. To be efficient he must be familiar with the advantages of electricity for household, commercial and industrial uses. It is impossible for a salesman to be really successful, unless he keeps pace with the industry, and is familiar at all times with the most modern methods in illumination or in drive, and the latest development in lamps, motors and accessories.

"The company should spare a reasonable expense in the organization of a new-business department. Make allowance for a systematic canvass of the residence and business district. This gives the salesman a speaking acquaintance with every prospective customer, and enables him to note the various installation in houses, offices and factories. A salesman who canvasses carefully and faithfully has won half the battle."

Lowell Central Station Office Has Lighted Sign.

The Lowell (Mass.) Electric Light Corporation, a Stone & Webster company, has installed a large illuminating sign on the front of its office building on Market Street. The sign is 35 feet high, 3 feet 6 inches wide at the top and 2 feet 4 inches wide at the lower end.

The sign has two faces and bears the words "Electric Light-Power," letters being arranged from top to bottom. The word "Electric" is of 30-inch raised groove letters, and "Light" and "Power" are 11-inch letters. At the top is a torch effect, and an electric bulb with red streamer effect. Around the rim of the sign is a high-speed border.

There are 834 5-watt 11-volt lamps in the sign, operated by means of a Reynolds flasher. The letters are in white. The torch at the top presents the effect of flames, while the torch handles and base of the electric bulb burn steadily. The lights in the center of the "bulb" form the semblance of a white filament and twinkle. The bulb is outlined with opal colored caps, and the base of the lamp and of the torch are of amber caps to represent brass. Red and amber lamps are installed to give the flame effect, ruby lamps impart the wavy ribbon effect encircling the sign, and green caps are used to border the columns and base.

POWER ENGINEERING

Problems Involving Motor Applications, Machine Characteristics, Power Sales Methods and Industrial Electric Heating

MOTOR DRIVE EFFECTS ECONOMIES IN SHOE FACTORY.

Installation in Seattle Shows How Machinery May be Grouped So As To Obtain the Highest Efficiency From Low Investment.

While some of the requirements that can be obtained by installing electric drive in a new shoe factory must necessarily be sacrificed where motors are simply substituted for line shafts of an old installation, still substantial savings are made, both in actual power cost, and also because of greater output due to the increased speed at which the machines operate.

A striking example of excessive friction losses is the use of "mill stands" which are practically a necessity in mechanically driven factories. In the average shoe factory a line of shafting is suspended from the floor timbers along the side of the building and driven from the main line shaft. In order to take full advantage of the available floor space and the natural lighting, a similar line of shafting is usually required at the end of the building, running at right angles to both main and line shafts. In order to make the turn necessary to supply power to this shaft a "mill stand" is usually employed. This contrivance requires the use of two idler pulleys supported on a vertical shaft and a very tight belt to carry the required load, with the result that considerable power is used simply to operate the belts and shafting.

By the use of an electric motor of the required size, belted to each line shaft, this loss in transmission is practically eliminated, and furthermore, a uniformly constant speed is insured to the shoe machinery. The belt-tightening device which is ordinarily supplied with each motor provides a simple means for keeping the belt at just the proper tension to avoid slipping.

All of the energy consumed by the main, line and countershafts, and quarter turns with the necessary belts, represents wasted power from which absolutely no revenue is derived, and any reduction of this loss means a greater profit in the selling of the finished product.

Another important advantage of electric motor drive over the mechanical methods that applies equally to old or new plants, is the increase of available floor space made possible by the heavy belting and countershafts employed to transmit power from one floor to another.

An annoying and expensive feature of mechanical drives is the liability of accident to the main driving pulley or belt. Not only is the entire working force held up and production delayed, but the disabled machinery is, temporarily, earning no return on the investment. Where motors are used an accident to motors or line shafting affects only a small group of machines, and comparatively few machines and operatives are made idle.

Out of from 70 to 100 operations performed on each pair of shoes about 70 per cent are now performed by machine. This machinery is of necessity small power apparatus, requiring, for example, on the large sole-cutting machines, a maximum of 2.5 horsepower, and on many of the small machines less than 0.1 of a horsepower for full-load operation. The power requirements on these machines are almost without exception intermittent and group drive is employed as combining the most economical method of operation and the lowest initial expense.

From 30 to 40 per cent of all power required in shoe factories is used to operate exhausters for removing dust, chips and shavings of leather which are collected from the buffing and grinding machines, edge trimmers and similar apparatus. The exhausters are ordinarily operated in pairs, preferably by a motor with shaft extended at each end. The load carried by these units is fairly constant, varying with the number of intakes in use.

Motor-Driven Inseamer In Shoe Factory of Zimmerman-Degen Company, Seattle, Wash.

Small motors, five horsepower or below, are ordinarily employed for driving sewing machines and correlated apparatus, including eyeletting machines, buttonhole stitching machines, small skivers, bobbin winders, etc. Investigations show that the motor is usually connected to the countershaft under the work benches by means of silent chain, from 10 to 30 machines being driven from each motor. Since the line shafts operate at about 350 revolutions per minute, motors designed to operate at 1,200 revolutions per minute are utilized, allowing a speed reduction of approximately three to one. In some cases the motor is suspended from the ceiling below and the chain or belt drive carried up through the floor to the line shaft.

The exigencies of modern industrial work have produced a variety of conditions so new and unusual that old-time

manufacturing operations cannot succeed with the measure which should be secured from the expenditure of time, labor and power.

This is exemplified in the plant of the Zimmerman-Degen Company, shoe manufacturers of Seattle, Wash., who have a complete motor installation in operation.

Stitching Room in Zimmerman-Degen Shoe Factory—Motors for Driving Stitchers Are Located Beneath Tables.

The company is now manufacturing 15,000 pairs of shoes each month, and is selling them as fast as they come from the finishing department. Business is increasing, and the company is enlarging its territory until at this time it serves the territory east to Butte, Mont., south into Arizona, Utah and portions of California, and north throughout all Alaska.

The company started operations with 20 employees, and a payroll of $300 a week. Within six months, it was employing 75 persons, and the payroll had jumped to $850 per week. Today, 100 workmen are busily engaged at the plant, and the payroll, including that for office force and traveling salesmen, approximates from $1,200 to $1,500 each week, an aggregate of from $62,400 to $78,000 yearly.

The factory is operated on a "piece" basis, and it is an institution where there has been so much work that the

Section of Seattle Shoe Factory With Motor-Driven Lasting Machines in the Foreground.

employees have been more than glad to welcome Sunday as a day of rest.

The Zimmerman-Degen Company has the only clicking machines for uppers on the Pacific Coast. The dies are flawless, insuring perfection, and the output per operator is 250 shoes per day. All lasting in the factory is done with a Rex pulling-over machine, combining "Nigger-head" side lasting and No. 5 bed-lasting machines. The company has the latest and most highly improved welting and Goodyear stitchers. The equipment includes a four-needle wax-thread vamping machine and a four-needle tip-stitching machine, which sews four parallel seams at a time, and can be speeded to 600 stitches per minute. A McKay heeling machine drives 19 nails at one revolution. A Goodyear channeling machine prepares insoles for welt work so that the work is exact and the shoe uniform.

The leather used by the company is chocolate imported chrome-tanned French veals, waterproof and imported French kid from stall-fed cattle, which means that every hide is free from brands, wire-cuts and blemishes; California chrome-tanned veals and California oak-tanned sole leather.

The following are the details of the motor installation at this plant:

BOTTOMING DEPARTMENT.

2 Rex Pulling-Over Machines.
1 Consolidated Lasting Machine.
1 Double-Taper Nail Tacker.
1 Davey Pegging Machine.
1 Rapid Standard Screw Machine.
1 Goodyear Insole Tack-Pulling Machine.
1 Model G Inseamer.
1 Universal Inseam Trimming Machine.
1 Goodyear Welt Beater.
1 Universal Twin Sole Layer.
1 Goodyear Rounding and Channelling Machine.
2 Model K Goodyear Stitchers.
1 Hathaway Stitch Separator.
1 Goodyear Levelling Machine.
2 New Loose Nailers.
1 Hercules Levelling Machine.
1 McKay Heeling Machine.
2 Universal Sluggers.
1 McKay Heel Trimmer and Grinder.
1 Power Heel Breaster.
1 Union Twin Edge Setter.
2 Edge-Trimming Machines.

CUTTING DEPARTMENT.

1 Ideal Clicking Machine.
All above are belted to overhead shaft and driven by two five-horsepower alternating-current motors.

SOLE LEATHER DEPARTMENT.

Planet Rounder.
Universal Goodyear Channeller.
Gem Tip Turner.
Apex Channeller.
Cable Tacker.
Apex Tap Trimmer.
Rotary Cementer.
Twin Sole Molder.
Four-foot Beam Machine.
Nine-foot Beam Machine.
26-Inch Summit Splitter.
7.5-Inch Summit Splitter.
Heel Compressor.
Model "S" Counter Skiver.
Stewart Counter Rolling Machine.
All above are belted to overhead shaft driven by one 10-horsepower alternating-current motor.

FINISHING DEPARTMENT.

Heel Scouring Machine.
Heel Breast Scouring Machine.
Bottom Sander.
15-foot Climax Finishing Shafts.
Regent Stamper.
All above are belted to overhead shaft driven by one three-horsepower alternating-current motor.
Blower system driven by one 7.5-horsepower alternating-current motor directly connected to fan.
Elevator driven by 10-horsepower direct-current motor of Washington Elevator Company.
Lighting 110 volts, three-phase.
All electric heaters, irons, etc., are connected with power circuit of 220-volt alternating current.

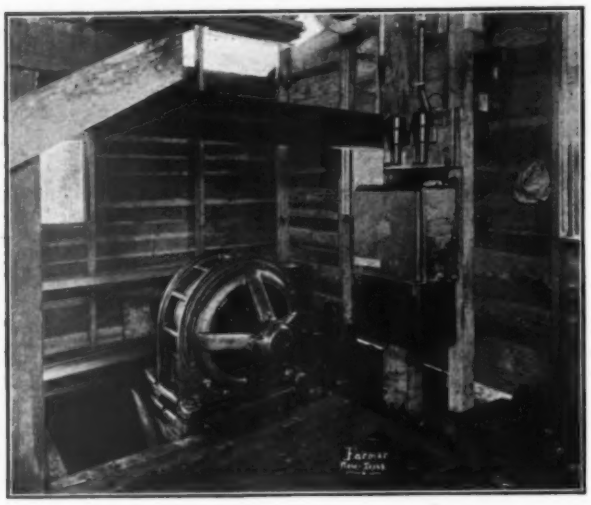
FITTING DEPARTMENT.

4 Union Specials.
10 Singers.
3 W & W.
4 Puritans.
6 Hooker and Eyeleters.
2 Skivers.
1 Perforator.
1 Beader.
1 Lacer.
1 Stamper.
All above belted to shaft under tables driven by one three-horsepower alternating-current motor.

N. F. Obright, of the power sales department of the Commonwealth Edison Company, has secured a five-year contract from the Wilson Steel Products Company, Forty-ninth Street and Western Avenue, Chicago, Ill., for off-peak service. The power load is about 700 horsepower, consisting of five to 200-horsepower motors, and the lighting load about 500 50-watt equivalents.

Barge Pumping Installation for Gravel Plant Operated By Motor.

A novel electric installation has recently been made near Waco, Tex., at the Potts-Moore Gravel Company.



View on Barge Showing the 60-Horsepower Squirrel-Cage Motor Operating the Centrifugal Pump.

This gravel company operates in an artificial lake 300 by 1,000 feet. A 60-horsepower, 2,200-volt, 60-cycle, three-phase induction motor, running at 1,200 revolutions per minute, has been belted to an eight-inch centrifugal pump, installed on a portable barge. The pump operates against quite a high head, picking up gravel and water from the lake and discharging same through an eight-inch pipe, 350 feet long, onto a revolving washing screen, 16 feet high, where gravel and sand are washed and separated. This material is dumped in turn into proper pits and loaded as desired with a steam shovel.

At the present time about 15 cars of gravel per day are being loaded. Operation of the motor has averaged eight hours per day and 24 days per month. The gravel company expects to operate with both a day and a night shift in the near future.

Energy is delivered to the lake, which is four miles from Waco, by means of a 4,400-volt line. The line is carried over the lake on "H" frames, constructed on eight-foot barges in the lake. These barges also serve to support the eight-inch pipe line through which the gravel is pumped. To enable the barge to move as desired, 200 feet of wire for each lead is carried on three spools mounted on the pumping barge. By winding the wire in or out the barge may be moved as desired.

An oil switch is mounted on the land where the line starts out over the lake and the starting compensator for the motor is mounted on the pumping barge. The pump was formerly operated by a steam engine. The owners are enthusiastic in their praise of electric power.

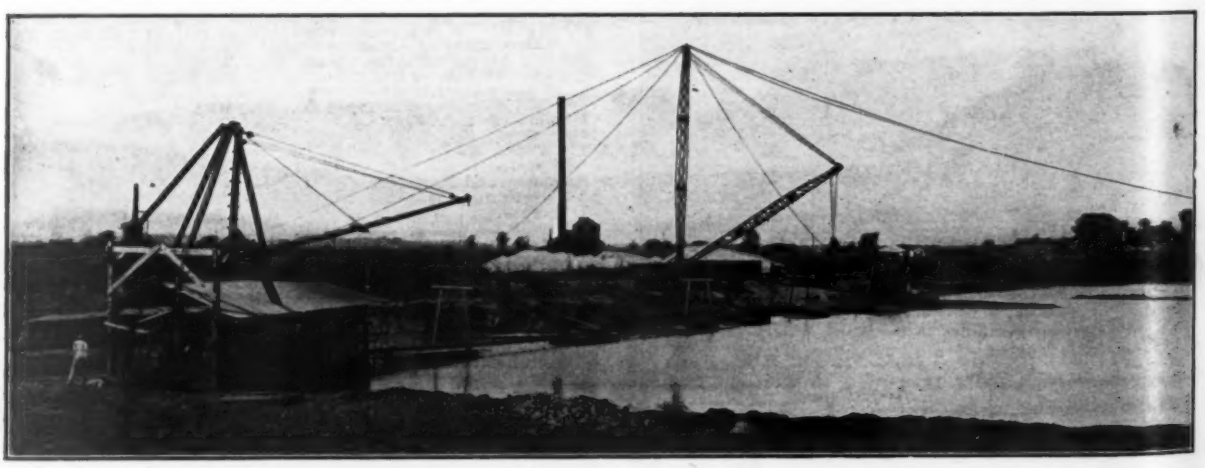
Group of Minnesota Farmers Buy Motor for Threshing.

Five progressive farmers on the lines of the Northern States Power Company (Faribault, Minn., division) recently installed electric light in their houses and barns. Pleased with the lighting service they have now jointly purchased a 15-horsepower motor and transformer mounted on a portable truck to enable the use of electricity for power purposes on their farms. The company has erected short lines from the transmission line to points near the barns so that when power service is required it is only necessary to move the motor to the point desired and connect it. By clubbing together the farmers have brought the original cost of the power equipment down to a low figure for each, which has been the principal reason for the slow developments of farm power business in the past.

Manager Cowperthwait, of the Faribault division, in a recent letter said: "We have installed several motors recently for the purpose of cutting corn and filling silos. It appears that a machine has now been put on the market which requires not to exceed 7.5 horsepower for this purpose and if this is satisfactory many such outfits will probably be sold next year."

Motor Drive Enables Small Bakers to Reduce Operating Costs.

Electric power to cut down the increasing costs of production is a remedy that numerous small Louisville manufacturers, such as bakers, are taking to at this time. In industries such as this where competition with still smaller shops is severe and where it is very difficult to effect a general advance, the electric motor is proving to be a solution of the problem—how to continue in business with the raw material market as it is and still sell a 12-ounce loaf of bread at a profit? Scarcely a day passes in Louisville but that some baker does not take out a permit for installation of a motor or two, or for re-arrangement of his motor installation and wiring. Almost invariably, when asked as to the installation, the bakers state that they are undertaking to cut production costs.



A View of the Barge and Lake Which Shows How the Power Line Is Handled by Means of "H" Frames Set on Barges.

ELECTRICAL CONSTRUCTION

A Department Devoted to Problems Relating to the Installation, Operation and Maintenance of Electrical Equipment

National Electrical Contractors' Association Working on the Solution of Many Problems.

The National Electrical Contractors' Association of the United States has three objects, any one of which would justify the efforts to make it a success—organization, information and standardization. The Association believes in practical co-operation of all men in the electrical industry; it believes in collecting valuable electrical contracting and electrical merchandising data and information and giving this to members and others; and it believes in standardizing forms and kinds of material and methods, so far as possible.

The Association has published a booklet setting forth its work for the past fifteen years and what it is trying to do. The booklet is sent out gratis. The Association spent large sums of money in standardization work, covering such subjects as sizes of conduit for installation of wires and cables, standard symbols for wiring plans, universal data and sales book, a standard bookkeeping system for electrical contractors, uniform proposal sheets, universal estimate sheets, all of which are sold without profit by the National Electrical Contractors' Association. It has also rendered assistance in the development of the National Electrical Code.

The Executive Committee and Publication Committee of the National Electrical Contractors' Association met at Cleveland, O., on October 4 and 5 and struggled with serious problems of vital interest to electrical contractors and dealers with a hope of finding satisfactory solutions.

At the sixteenth annual convention of the Association, at New York City, last July, many subjects were discussed and the reports of its committees show that the Association has accomplished much in the line of placing electrical contracting on a higher plane and adjusting unsatisfactory conditions in the business.

The Executive Committee continues the study of the problems confronting the electrical dealers and contractors, and at the Cleveland meeting, Col. Robley S. Stearnes, of New Orleans, the newly elected president of the Association, emphasized his absolute belief in a price preferential for Association members in buying goods; he said the members are entitled to this better price because they are a part of a great buying power and are responsible and reliable. Colonel Stearnes believes in the Association having a trade-mark or emblem which will give the members preference over non-members. He announced that he will give a handsome silver loving cup to the member securing the greatest number of new members this year.

The National Electrical Contractors' Association last July joined the Chamber of Commerce of the United States of America and is supporting that organization through its national councillor, Colonel Stearnes, and the other five delegates. The Association is also working in close harmony with the National Association of Manufacturers on the conservation question.

The National Association is considering the advisability of closer affiliation between national, state and local associations, which might mean a contractor and dealer could not join one association without joining all three bodies.

One of the most important Association committees is the Cost Data Committee, now collecting information on unit costs of labor and material. This committee will spend considerable money and has planned to have a national discussion on unit costs at the next annual convention of the Association, which will be held in New Orleans, in October, 1917. The Cost Data Committee is composed of the following: Harry C. Turnock, chairman, Cleveland, O.; Joseph A. Fowler, Memphis, Tenn.; and Arthur J. Newell, Holyoke, Mass.

Mr. Fowler, chairman of the Labor Committee, has pointed out to the Association that labor on any contract, large or small, is now a gamble and that the Association should give its members accurate information on this subject.

The National Electrical Contractors' Association has effected a saving for a large number of its members on liability insurance and workmen's compensation through an exclusive arrangement with an insurance organization.

Members of the Association have suggested subjects for consideration by the Executive Committee and these were reported by members of this committee as follows:

J. T. Marron, of Rock Island, Ill., feels that electrical contractors should be paid for bidding on contracts. He feels that if an electrical contractor spends his time and money to prepare an estimate, he should be paid for it even if he is not successful in getting the job.

G. M. Sanborn, of Indianapolis, Ind., has called attention to the new and valuable information in the Association Universal Data and Sales Book, and believes this should be used by every electrical contractor in the United States.

M. G. Buchan, of Cleveland, O., feels that electrical jobbers are getting into the field of the electrical contractor by closing contracts direct. Mr. Buchan suggests national consideration of this subject.

Jos. A. Fowler, of Memphis, Tenn., chairman of the Committee on Labor, and also of the Insurance Committee, says these two subjects alone warrant every electrical contractor in the United States joining the National Association.

Paul H. Jaehnig, Newark, N. J., chairman of the Legislation Committee, is collecting laws and ordinances from all over the United States and furnishing this information free to members who desire to work for better electrical ordinances in their cities. Mr. Jaehnig believes the N. E. C. A. should take active steps with a view of trying to bring about guaranteed wiring by the Association for its members.

W. C. Peet, of New York City, feels that electrical contractors should be protected in making estimates and bids so that a general contractor or house owner could not use one contractor's price to lower the price of another bidder.

Membership in the National Electrical Contractors' Association gives an electrical contractor and dealer a prestige and information he could get in no other way. Electrical jobbers and manufacturers appreciate what the Association is doing to improve conditions, especially along lines of standardization and they very often favor members over non-members. The Association has eleven hundred members in the United States, and in the list will be found the most responsible and progressive electrical contracting firms.

POLES AND POLE-LINE CONSTRUCTION.—I.

Valuable Suggestions from a Paper Presented Before the Indiana Electric Light Association.

By G. L. Lindsley.

It has been our observation covering a period of 25 years of experience in the production of poles and the distribution of them to the consumer, that the selection of poles for line construction has not received the attention it should at the hands of the engineering and construction men.

Engineers figuring on any other structure requiring a firm and lasting foundation spare no expense to secure the very best materials for that purpose, knowing that upon the foundation of the structure depends its life and necessarily its value. We have, however, known of central stations contracting for their pole-line work to be done by outside parties where the specifications are complete and rigid on all the materials entering into the work excepting the poles, and where no specifications were given for poles.

Poles for this construction we consider should be of the very best quality and should be selected for their strength and lasting qualities. This is becoming more necessary because of the high price of the materials entering this part of the work. Poles are increasing in price as the years go by, labor is also much higher than it was a few years ago, and the timber from which poles are manufactured is becoming scarce.

The number of poles used annually in the United States for new construction and renewals amounts to an enormous quantity. Statistics gathered by the Department of Commerce at Washington place the number of poles used annually at about five million; 23 per cent of this number are used by electric light and power and railway companies. Seventy per cent of the poles in use today are cedar, the balance being divided between chestnut and other woods, chiefly cypress and southern pine.

These latter are of course only used in the South as they are not found to be durable in the ground outside of the locality in which they are grown. The chestnut is used principally in the sections where it grows due of course to the cheapness in reduced transportation charges. This is one of the woods that is found to be less durable outside of the locality in which it grows. The same will apply to cypress and southern pine. The value of a pole is in its lasting qualities and its ability to carry the overhead load required of it. The cedars have been adopted almost universally as the standard pole in electric light and transmission line construction. Cedar has the necessary quality of long life in the ground, it has symmetry, it has strength, and is less dangerous to linemen in all kinds of weather, can be easily climbed, is lighter and cheaper to handle. The western species is especially noted for its strength and lasting qualities, as shown by the Forest Service bulletins published by the Agriculture Department of our government at Washington for the benefit and guidance of pole users.

Before the Forest Service made any effort to secure these data on the different woods entering into pole-line construction, the company with which I am associated had found it necessary to secure data on the strength of western red cedar and northern or eastern cedar. Our tests agree in every respect with those of the Forest Service. We found that the western red cedar was much stronger than other cedar. The Forest Service tests show that it has 28 per cent more strength and that it is not necessary to use extra-large cedar poles at the ground line in order to carry heavy overhead construction and to allow for decay at the butt. Table I is quoted from Forest Service report on project L 31 A.

TABLE I.—RESULTS OF TESTS OF FULL-SIZED POLES.

	Top Diameter	Per cent moisture	Rings per inch	Weight (air-dry)	Modulus of rupture	Stiffness factor	Top reaction at maximum load
	Inches			Lbs. per cu. ft.	Lbs. per sq. in.		Lbs.
				NORTHERN WHITE CEDAR.			
Ave.	7.5	27.1	29		3,540	3.07	2,160
Max.	8.1	40.5	41		4,720	4.07	2,820
Min.	7.0	17.8	19		2,540	2.32	1,560
				WESTERN RED CEDAR.			
Ave.	7.5	20.7	24	27.0	6,910	7.03	2,490
Max.	8.5	22.8	36	29.7	8,260	9.38	3,230
Min.	6.9	18.0	10	23.3	5,020	5.12	1,670

The modulus of rupture is the measure of ultimate strength or breaking load of the pole and as given above is computed on the basis of the diameter at the ground line. The top reaction at maximum load is the pull which, if applied one foot from the top end, would break a pole 25 feet long set five feet in the ground.

The moduli of rupture and top reaction at maximum load are not in the same proportion for the two groups of poles because of the greater ground-line diameter of the northern white cedar poles.

In comparing the strength of these two groups of poles the top reaction at maximum load is the best figure to use. In using modulus of rupture to compare a western red cedar pole with one of nothern white cedar of the same top diameter the greater ground-line diameter of the white cedar must be taken into account, remembering that the strength of the poles is proportional to modulus of rupture multiplied by cube of ground-line diameter.

Table II of results of minor tests gives a comparison of the strength of clear sound wood taken from the poles.

TABLE II.—RESULTS OF BENDING TESTS ON SMALL SPECIMENS CUT FROM POLES.

	Rings per inch	Oven-dry weight Lbs. per cu. ft.	Moisture	No. of tests	Modulus of rupture Lbs. per sq. in.
		NORTHERN WHITE CEDAR.			
Ave.	30.9	18.9	9.9	56	7,660
Max.	65.0	21.6	13.7	1	10,010
High 10 per cent	48.0	21.4	11.5	1	9,780
Low 10 per cent	18.0	16.1	9.1	6	5,780
Min.	14.0	15.6	9.0	1	5,300
		WESTERN RED CEDAR.			
Ave.	24.1	23.9	10.2	53	10,620
Max.	46.0	31.2	14.5	1	12,840
High 10 per cent	40.2	28.3	11.6	6	12,390
Low 10 per cent	9.8	20.2	9.5	6	7,500
Min.	6.5	17.7	9.4	1	5,660

Northern or white cedar weighs per cubic foot when dry 19.7 pounds and the western red cedar 23.7, a difference of four pounds in favor of the western cedar. The specific gravity or density of northern white cedar is 0.32 and western red cedar 0.38, or in favor of western red cedar, since the density of a piece of wood is an indication of its quality. For the purposes of this paper, we will deal only with the qualities of these cedars relating to the subject under discussion and omit irrelevant qualities. Take next the breaking strength (modulus of rupture). The northern white cedar averaged 3,540 pounds per square inch, the western red cedar averaged 6,910 pounds per square inch, a difference of 3,370 pounds in favor of the western red cedar. The character and quality of the two species are much alike, differing mostly in two qualities.

Southern White Cedar.—This species is very much like the northern white cedar, in fact the character of the two is nearly the same. The only states in which the species commonly called southern cedar are grown are Delaware, Florida, Georgia, Maryland, New Jersey, North Carolina, South Carolina and Virginia. A great number of poles shipped north under the name of southern cedar or juniper are nothing more than cypress. Cypress, if we could use nothing but the heartwood, would be the everlasting wood, as the heart will never rot, but the sap on a cypress pole constitutes about one-third of its diameter, and this sapwood is subject to decay within a very few years.

Chestnut.—The United States Bureau of Standards, we

understand, classes chestnut for strength (that is, modulus of rupture) with western red cedar, cypress and southern pine, that is, it is 28 per cent stronger than our northern white cedar. It is, however, being discarded in Pennsylvania and other eastern states, and cedars are taking its place principally because it has not the lasting qualities, and also the great difference in cost of handling. It costs at least 25 per cent more to erect a line of chestnut than it does a line of cedar, the chestnut weighing nearly 50 per cent more than cedar, thereby requiring nearly 50 per cent more labor and other expense attendant upon handling, hauling and erecting. One of the public utilities in Pennsylvania, that uses several thousand poles annually, has recently changed over from chestnut to cedar. Having used chestnut for years, they found the life of the pole too uncertain; some poles would go down in a moderate wind storm after being set only a few years, very unexpectedly with no warning, while others would last for 10 or 11 years. They decided on account of the inconvenience and this uncertainty and attendant additional expense, to look for a better pole. They made a thorough investigation of the merits of the cedars, their engineers went into the matter very thoroughly and I give you herewith the results of their engineers' labor in Table III.

TABLE III.—ULTIMATE STRENGTH OF WESTERN RED CEDAR POLES WITH 7-INCH TOP DIAMETER.

Length of pole, feet	Butt diameter, inches	Ultimate strength, based on maximum fiber stress of 6,672 pounds per square inch
35	11	72,653.034 foot-pounds
35	12	94,323.398 foot-pounds
40	11	same as 35', 11" butt
40	12	same as 35', 12" butt
45	11	same as 35', 11" butt
45	12	same as 35', 12" butt
50	11	same as 35', 11" butt
50	12	same as 35', 12" butt
50	13	119,403.07 foot-pounds

For computation of Table IV, I took the following problem: A 35-foot western red cedar pole; set 5½ feet in the ground; diameter of wires with ½ inch of ice, 1.23 inches; 60-mile-an-hour wind; top diameter seven inches, butt diameter 11 inches; adjacent spans 120 feet; maximum fiber stress, 6,672 pounds per square inch. The problem for 20 wires was computed with a 40-foot pole. According to the N. E. L. A. specifications, I have used a 60-mile-an-hour wind with a pressure of 9 pounds per square foot of projected area of pole and 9 pounds per square foot on wires.

TABLE IV.—STRESSES ON WESTERN RED CEDAR POLES DUE TO WIND PRESSURE WITH DIFFERENT LOADINGS.

Number of Wires	Stresses in foot-pounds due to wind pressure			Factor of safety	Class of pole suitable
	On pole	On wires	Total		
2	2,719.5	5,766.2	8,485.7	8.5	Between B&C
4	2,719.5	11,532.5	14,252.0	5.1	Between B&C
6	2,719.5	17,298.7	20,018.2	3.6	Between B&C
8	2,719.5	23,065.0	25,784.5	2.8	Between B&C
10	2,719.5	28,044.0	30,763.5	2.33	Between B&C
20	3,612.5	62,385.5	65,998.0	1.1	Between A&B

An important qualification of the cedars is their extreme durability when exposed to decay. My experience has been that northern white cedar when untreated will last longer in the ground than any of the woods mentioned in this report or upon which we have any data. It is a wood that has been used for poles ever since wires have been carried overhead. Western red cedar has been used east of the Mississippi River only since 1899. I have examined recently many poles that my company shipped into this part of the country that year, and found them in a wonderfully good state of preservation. The majority of these are still good for ten years' more service. This is convincing evidence that the western red cedar poles will give the same service as the northern white cedar, with the advantage that when decay does set in, it will not be liable to destroy the efficiency of the pole as quickly as it will in other cedars on account of the thinness of the sapwood. The sapwood is the only part of the pole that rots at the ground line in any species.

TABLE V.—STATEMENT SHOWING ANNUAL COST OF CEDAR AND CHESTNUT POLES BASED ON PRICE F. O. B. PITTSBURGH.

Cost of a 7-inch 35-foot chestnut pole	$ 5.75	
Setting same in line	5.00	
	10.75	
Life of above pole 10 years.		
Interest figured at 6 per cent per annum.		
Annual charge		$ 1.46
Adding charge for one renewal of pole	15.75	
Annual charge		2.13
Cost of an 8-inch 35-foot western cedar pole	$ 8.80	
Setting same in line	3.90	
	12.70	
Life of above pole 16 years.		
Interest figured at 6 per cent per annum.		
Annual charge		$ 1.25
No charge for renewal, no renewal needed.		
Net saving		0.88
Cost of a 7-inch 40-foot chestnut pole	$ 7.75	
Setting same in line	8.00	
	15.75	
Life of above pole 10 years.		
Interest figured at 6 per cent per annum.		
Annual charge		$ 2.13
Adding charge for one renewal of pole	5.00	
	20.75	
Annual charge		2.80
Cost of an 8-inch 40-foot western cedar pole	$10.20	
Setting same in line	6.25	
	16.45	
Life of above pole 16 years.		
Interest figured at 6 per cent per annum.		
Annual charge		$ 1.61
No charge for renewal, no renewal needed.		
Net saving		1.19

Demonstrating that a western cedar pole will save $0.88 per pole on 35 feet, and $1.19 per pole on 40 feet over chestnut, the western pole being an 8-inch top and the chestnut a 7-inch top.

Figuring by the mile, 40 poles to the mile, 35-foot poles, saving is $35.20.

Figuring by the mile, 40 poles to the mile, 40-foot poles, saving is $47.60.

This is equal to 6 per cent per annum on the entire cost of line.

The following table is taken from some data prepared by a committee appointed by the Government, having under consideration the question of the strength and the carrying capacity of poles. The figures show the allowable number of No. 4 solid copper triple-braid weatherproof wires to be carried by 35-foot western red cedar poles, having a ground-line circumference of from 32 to 44 inches and under average heavy, average medium and average light loading and hazards.

TABLE VI.—ALLOWABLE LOADING ON 35-FOOT WESTERN RED CEDAR POLES.

Hazard and Loading	Span in Feet	Circumference of Pole at Ground Line in Inches						
		32	34	36	38	40	42	44
Average Heavy Loading and Hazard	100	8.0	10.0	12.5	15.0	18.0	21.5	25.0
	125	6.5	8.0	10.0	12.0	14.0	16.5	19.0
	150	5.5	7.0	8.0	10.0	11.5	13.5	16.0
	200	4.0	5.0	6.0	7.0	8.5	10.0	11.5
Average Medium Loading and Hazard	100	13.5	16.5	20.5	24.5	30.0	36.0	40.0
	125	10.5	13.0	16.0	19.0	23.0	27.0	33.0
	150	9.0	11.0	13.0	15.5	18.5	22.0	26.0
	200	6.5	8.0	9.5	11.5	13.5	16.0	18.5
Average Light Loading and Hazard	100	22.0	27.0	34.0	39.0	48.0	54.0	61.0
	125	17.0	21.0	26.0	32.0	36.0	43.0	49.0
	150	14.0	17.0	21.0	25.0	31.0	36.0	41.0
	200	10.0	12.5	15.0	18.0	22.0	26.0	31.0

In computing the above figures a maximum allowable fiber stress was used which was only one-half of the assumed ultimate strength of the pole. In other words, a factor of safety is obtained which is double that required. Forest Service Bulletin No. 95 giving a report of tests on western red cedar shows a modulus of rupture of 10,500 pounds per square inch, whereas in computing the butt diameter in the above table a modulus of rupture of 5,250 pounds to the square inch is used. The above figures are based on the use of a 35-foot pole. In using a 40-foot pole the rule is, in other specifications, to add two inches to the circumference measurement at ground line for each additional five feet of pole length. N. E. L. A. specifications for western red cedar poles are as follows: On a Class C 35-foot pole seven-inch top, 32 inches six feet from butt; Class B 35-foot pole eight-inch top, 36 inches six feet from butt; Class A 35-foot pole nine-inch top, 40 inches six feet from butt.

Features of Wilmington Fire-Alarm System

Recently Completed Installation in Delaware City Embodies Many Interesting Points, Especially in Central-Office Equipment

By George A. Broder

A FEW weeks ago the new fire-alarm apparatus installed by the Gamewell Fire-Alarm Telegraph Company, of New York City, at Wilmington, Del., was completed and placed in operation. The old system consisted of four box circuits connected to a four-circuit automatic repeater and storage-battery switchboard.

With the new up-to-date central-office system there are 10 box and four alarm circuits connecting to a 30-circuit protector board, 14 circuits being used for the fire-alarm lines and 16 for the new police-patrol system.

There is a 10-circuit automatic repeater and a 20-circuit automatic storage-battery switchboard of the central-office type. There is also a recording set consisting of a punch register and time stamp which records all incoming and outgoing alarms. A non-interfering type of manual transmitter with 97 signal wheels, corresponding to the street-box numbers, is used to send out still alarms and emergency calls.

On the ten box circuits there are 97 non-interfering type of signal boxes, seven of them being auxiliarized. In the business section they are mounted on ornamental pedestals and in the outlying districts on wood poles and connected by underground cables and overhead lines respectively to the central office, which is located in the basement of the new City Hall on the corner of Tenth and King Streets.

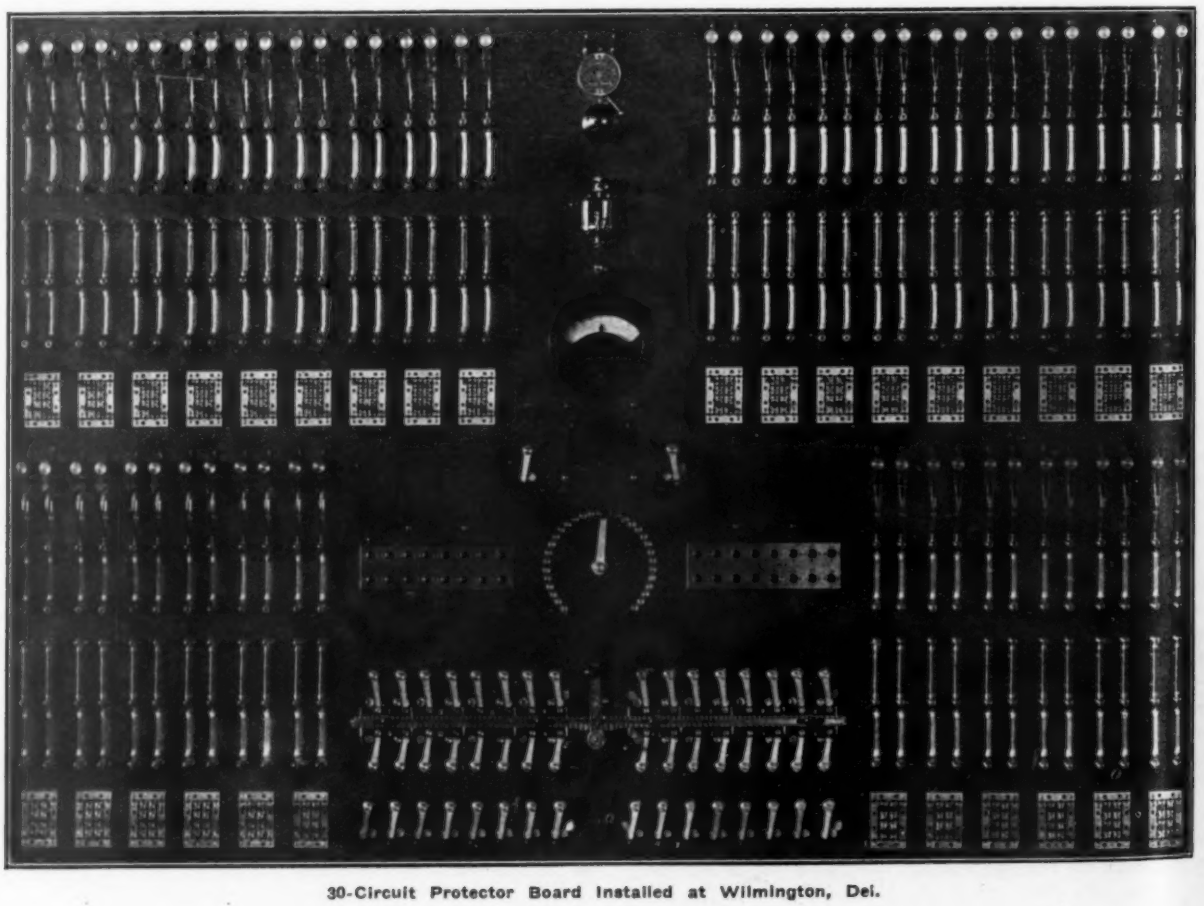
The circuits are so arranged that one or more engine houses are connected in each circuit, over which all alarms are received and recorded visually and audibly on a register and combined indicator and gong, and publicly sounded on tower bells to summon volunteer firemen in each district.

From the street boxes, which are connected in series loops of 10 to 20 per circuit, lines enter the terminal room by multiple conductor No. 14 rubber-covered wires in lead-sheathed cables from the underground conduits and terminate on a 50-line terminal board where any line may be tested or cross-connected by jumper wires. Rubber covered No. 14 single-braid wires in rigid conduits connect from here to the protector switchboard in the operating room.

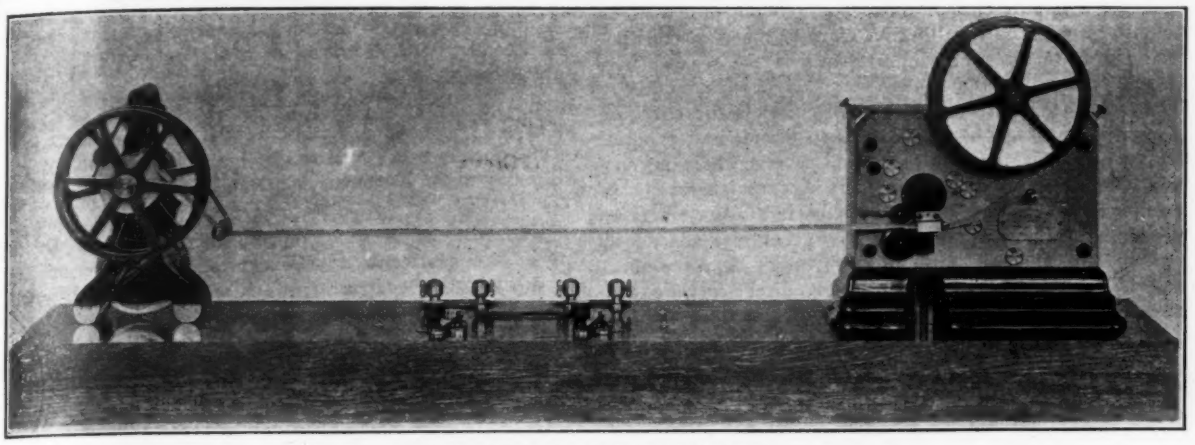
Each circuit passes through a one-ampere fuse and Argus type lightning arrester to a combination pin switch and plush protector, which is a small overload circuit-breaker operating to open the circuit and close a local alarm-bell circuit, when the current exceeds one-half an ampere.

From here each line passes through a one-half-ampere office protecting fuse to a ground-test switch and to repeater switches which give various combinations, such as connecting all circuits in series and off the repeater, all in parallel and on the repeater, and any circuit in series with any other one.

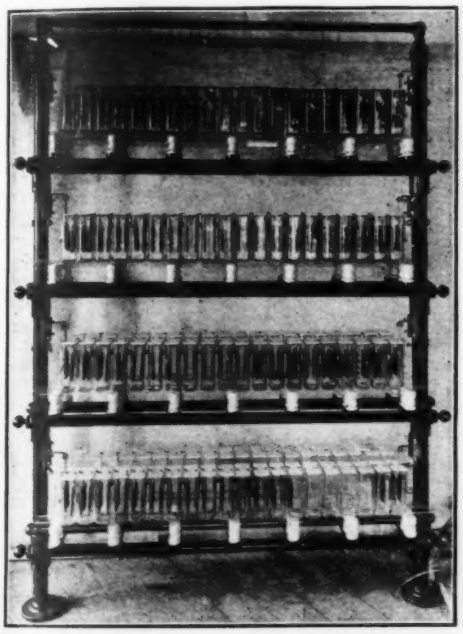
The repeater is weight-driven and automatically wound by a small 220-volt single-phase motor. Any one of the 10 box circuits will compel the mechanism to repeat the signal over all subjective box and alarm circuits at the unit



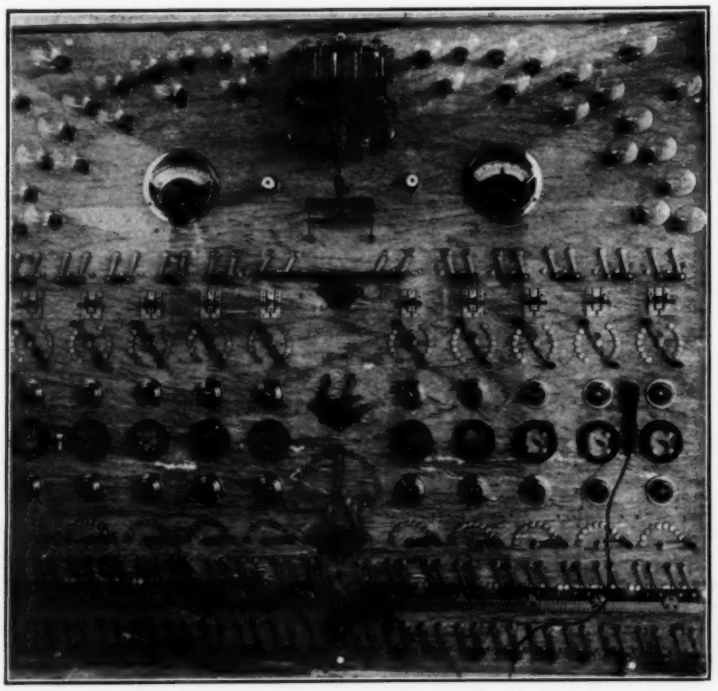
30-Circuit Protector Board Installed at Wilmington, Del.



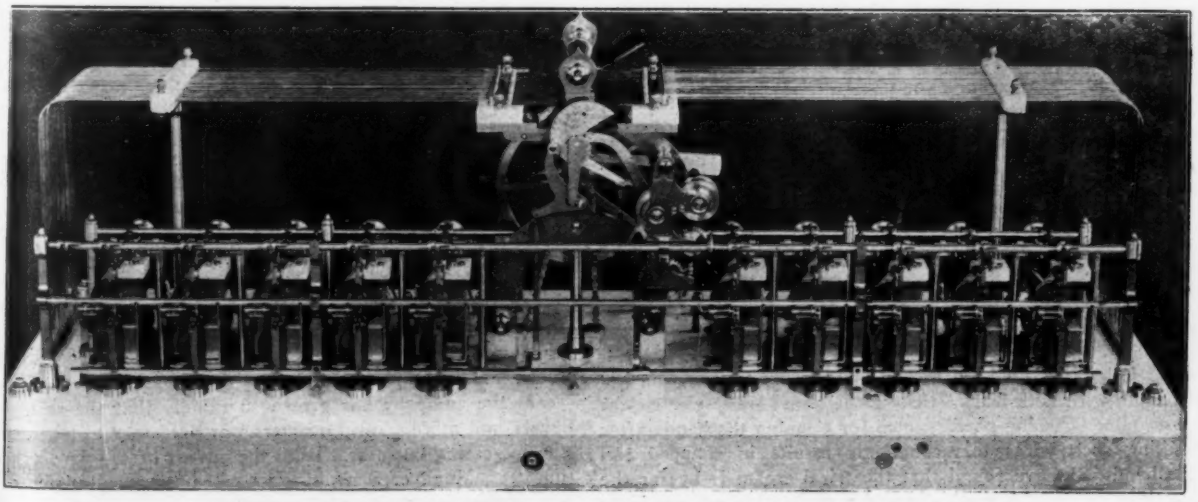
Recording Set Installed in Central Office.



View of Storage-Battery Rack with Batteries in Place.



Front View of 10-Circuit Automatic Storage-Battery Controlling Switchboard.



Mechanism of 10-Circuit Automatic Repeater Installed at Wilmington Central Office.

time of the system, which is one and three-quarter seconds, and in the event of two or more boxes being pulled at or about the same time on different circuits the positive non-interfering feature prevents interference of the separate signals.

The automatic battery switchboard controls the charging and working storage batteries on each circuit and protects them against overload, underload and reverse charging current. The cells are of the Chloride Accumulator type, of six-ampere-hour capacity, and arranged in duplicate sets on each circuit. They are mounted in glass jars placed on metal battery racks in the battery room. A three-phase motor direct-connected to a 220-volt direct-current generator, delivering nine amperes at full load, is used to charge the batteries.

The recording set consists of a punching register and time stamp operating from a 24-volt local battery and controlled by the repeater, which closes the register circuit, and in turn operates the time stamp to print the year, month, day, and exact minute an alarm is received or transmitted over the system.

The transmitter is connected in one of the box circuits and upon the receipt of a fire or emergency call the attendant places the signal wheel corresponding to the nearest street box number on the movement and pulls it similarly to a street box for one to four rounds of the alarm.

Motor-Maintenance Hints.

Recently I had a motor to repair which gave trouble in the form of chattering and sparking of the carbon brushes. Upon inspection I found that the brushes were hard and would not make a smooth contact on the commutator. This caused a rough commutator and the brushes were covered with a fine copper plate. As an emergency scheme to keep the motor in operation until proper brushes arrived I soaked the brushes in a pail of kerosene over Sunday and found that they softened enough to be used temporarily with good results.

On alternating-current motor-repair jobs it will often be found that the collector rings are rough. A good way to put the collector rings in good running order is as follows. Moisten a strip of No. 00 sand paper with machine oil and use it to smooth the rings, by carefully going over the contact surface; then wipe each ring with a piece of clean cotton waste. The oil on the sand paper helps to produce a clean smooth surface.

Not long ago I had a job of cleaning and painting some motors throughout a large manufacturing concern. The motor casings were covered with a thick film of oil and dirt which made good painting impossible. I used the following scheme to overcome the difficulty. I removed as much oil as possible with a piece of cotton waste dipped in gasoline. The second operation consisted of a wash made of one gallon of hot water to which one-half pound of concentrated lye had been added. This solution was applied with a wooden-handled mop as it was too strong for use with bare hands. This solution, used as a final wash, removed all traces of the grease. The motor was wiped dry with clean cotton waste and then was ready for painting. Care should be taken not to get the lye on the windings.

M. J. Moriarty.

For Cleaning Electricians' Hands.

The following is a boon to the wireman or anyone who has to handle wire with black, sticky insulation. Many electricians use gasoline, washing powder, etc., for cleaning the hands after handling such wire; this commonly results in chapped and sore hands. I have found that theatrical cream is by far the best thing to use. A small can and a cloth takes up very little room in the tool box. It surely removes the dirt and leaves the hands soft and clean.

Sim Naylor.

Among the Contractors.

The Davis Electric Company, Newark, N. J., has been awarded a contract for electric work in the factory of the American Metal Bed Company, Clifton Avenue.

Louis J. Grossman, trading as the Grossman Electric Company, announces the removal of his office from 102 Merchants Building to 115 North Sixth Street, Philadelphia, Pa.

The Crescent Electric Company, Kansas City, Mo., has moved to its new quarters at 813 Delaware Street. The company will continue to do contracting work and will carry a small line of supplies.

Joseph S. Miller & Company, Philadelphia, Pa., has received a contract for electric work and equipment for the new wire-wheel manufacturing plant of the Budd Manufacturing Company, at a price of $20,000.

Nutt Brothers, of Lindsay, Cal., have purchased the business and equipment of the Exeter Electric Company in Exeter, Cal. H. G. Nutt will take active charge of the new branch, while S. E. Nutt will remain in charge of the Lindsay establishment.

John A. Blomquist has disposed of his interest in the Rockwell-White and the Hailey Electric Companies, Hailey, Idaho. The purchase of the interests by the owners of these two companies is a forerunner of their consolidation, which will soon be completed.

C. A. Pierson, manager of the American Electric Equipment Company, Kansas City, Mo., reports that electric ranges, of which he has been making a specialty, are moving rapidly. This company does not do much of the larger contracting, but is doing a brisk small business.

The Central Electric Company of Peoria, Peoria, Ill., has under way an exceptionally large amount of construction work. Among large buildings on which electrical work is now proceeding is a public school at Atwood, Ill., and a large residence at Pekin, Ill.

The contract for the new electric-lighting system which is to be installed at the normal school building, Brockton, Mass., a system of telephones between all buildings and a renewal of the clock and call systems in the school building, has been awarded to the Tremaine Electric Company, of Brockton, the price being $10,995.

W. L. Hutchison, president of the Kansas City (Mo.) Electrical Construction Company, reports the following recent wiring contracts: The new Railway Exchange Building and annex, a $2,500 contract; the six-story Emma J. Meyer Building, a $1,200 contract; high school and two ward schools in Moberly, Mo., a $1,800 contract; the new Independence (Mo.) high school, a $1,500 contract; a four-story hotel at Parsons, Kans., and the installation of a lighting plant in the Missouri & Kansas elevator, a $3,000 contract.

The Electric Repair & Wiring Company, Kansas City, Mo., formerly at 710 Wyandotte Street, has moved into new quarters at 721 Delaware Street, increasing its floor space four times that at the former address. Although organized only two years the company has grown so rapidly that the removal to larger and more central quarters was necessary to take care of the increasing business. With the advent of the firm into new quarters, Manager Shaw says he will open an all-night trouble department for the convenience of the commercial district. This is an innovation in the electrical business of Kansas City and in the entire electrical industry.

DOLLAR WIRING KINKS

Every reader is invited to contribute to this page. It does not matter how few words are used to explain a "Dollar Wiring Kink," provided the idea is made clear; if a diagram is necessary, a rough pencil drawing will serve. The idea itself must, of course, be new and bright. A dollar will be sent to the contributor upon publication.

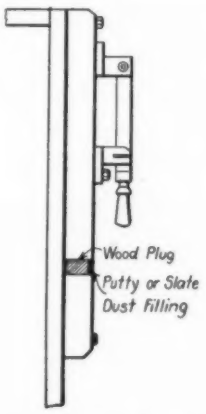
Using Door Knob for Boring.

It is often necessary to bore a hole in close quarters, like the plate on top of a partition where the roof slants down close to it so that a brace and extension cannot be used. In such cases the knob may be taken off a door and the bit shank inserted in this and it will be found a very serviceable tool. This also sometimes comes handy, if one has forgotten to bring a brace along, even though it is slow and tiresome.

Henry C. Peck.

Plugging Holes in Slate Panels.

Holes in a slate panel or switchboard, may be easily and neatly plugged in the following manner: Whittle a soft plug to a size that will have to be driven slightly into the hole you wish to close, leaving a space of one-sixteenth or one-eighth of an inch, which may be filled with slate dust or putty, darkened with lamp black to match the finish of the panel. If a



Method of Plugging Hole in a Slate Panel.

polish or finish is desired, first apply a coating of black lacquer; when thoroughly dry touch up lightly with a quick-drying varnish.

H. B. Stillman.

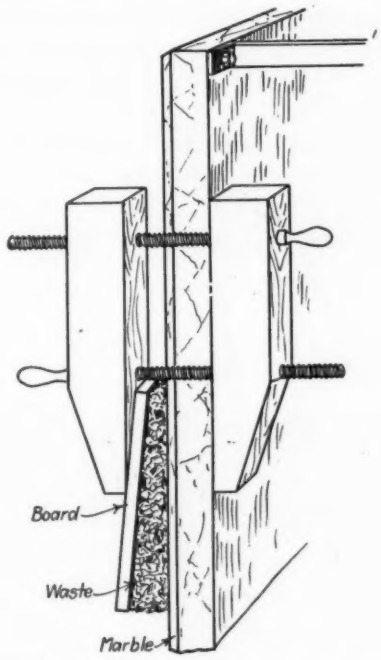
Bicycle Tubing for Extension Bits.

Where an extra long bit is needed, get a piece of bicycle tubing of a size to take the round portion of the bit. Saw the bit off an inch above the shank, place the two parts in the ends of the tube and fasten with pins of solder. I mention bicycle tubing because it is both light and strong. Several of these in different lengths will be found very handy in the electrical shop. For the same weight of the same material, tubing is very much stronger than solid rod or, to put it the other way around, for the same strength tubing is much lighter than solid rod.

E. F. Korns.

Removing Grease Spots from Marble Switchboards.

I find no method as good and sure for cleaning grease spots from marble as proper use of gasoline. However, it should never be applied in a hit-or-miss fashion—a little dab now and then when you may happen to think of it. The best results are obtained by using waste or clean rags, thoroughly saturated with the fluid. As the gasoline evaporates very rapidly, the waste should be kept moist, renewing the gasoline every hour or so, depending largely upon the size of the stain. The quickest method is to apply pressure, this causing the gasoline to penetrate and soak up the grease spot more quickly, which evaporates



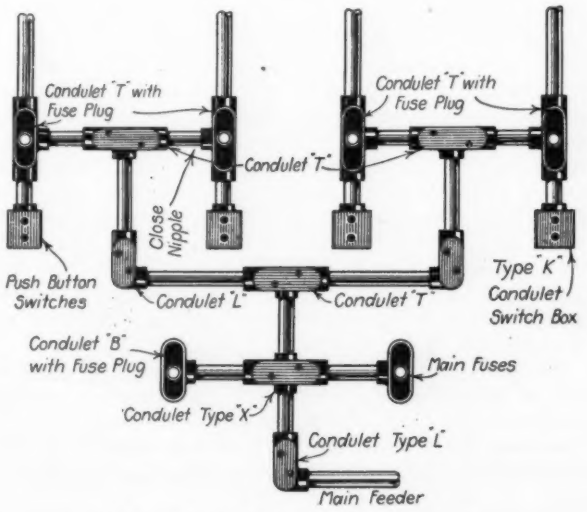
Removing Greasy Spot on Marble Board.

with the gasoline, and leaves the marble spotless without injuring the polish of the board in any way.

H. B. Stillman.

Using Conduit Fittings in Place of a Panelboard.

A neat and inexpensive substitute for a panelboard cabinet may be made of Condulets or similar conduit fittings for places where much of the wiring is open con-



Use of Condulets in Place of Panelboard.

duit work. The Condulet openings are covered with blank covers except where a fuse is desired, at which point an obround Conduletto porcelain receptacle with fuse plug is used. The switches are of the flush type, mounted in Condulet or Adaptiboxes.

W. B. Atkins.

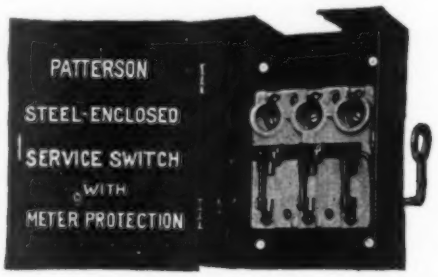
NEW APPLIANCES

A Weekly Review of the Latest Developments and Current Information Respecting Electrical and Kindred Mechanical Appliances

Safety Inclosed Switches for Motor and Service Installations.

A line of inclosed switches, service boxes and meter adapters, designed to guarantee safety and security in motor, service and meter installations, has been placed on the market by Stanley & Patterson, 23 Murray Street, New York City.

The switches for motor installations are inclosed in steel boxes provided with padlock and master key, all current-carrying parts being protected when the cover of the box is closed. The boxes have rugged, hinged doors made of pressed steel with electrically welded corners, finished in heavy baked japan and provided with six one-half-inch knockouts. The latter provide easy entrance for conduit, open wiring or molding. The three knockouts on both sides of the box are in line, making easy gang installation of any number of boxes, yet permitting individual circuit cutouts. Ample space is provided in the interior of the boxes for making all necessary wire connections, and a separate compartment is provided to hold a reserve set of fuses. The outside lever arm, which operates the switch, is thoroughly insulated, is of sturdy construction, fastened by heavy machine screws and cannot be damaged by rough usage. The switches are rated at 30 amperes, 125-250 volts, with a capacity for alternating-current motors of one horsepower, 110 volts, single-phase; two horsepower, 220 volts, single-phase; two horsepower, 220 volts, three-phase, three-wire; four horsepower, 220 volts, two-phase, three-wire; and for direct-current motors, three horsepower, 110 volts, and five horsepower, 220 volts. These switches are manufactured in both cartridge and plug-fuse types, two and three-wire.



Safety Inclosed Service Switch. Adapter for Meter Protection Fits on Top.

The Patterson service boxes are very similar in construction to those for use in connection with motors, and are furnished with plug or inclosed fuses, two and three-wire. The doors are designed for use of either padlocks or seals, and the boxes have removable sides which are interchangeable.

For completely housing current-carrying leads from the service box to the meter, adapters, or meter protection trims, have been designed, these being furnished for all standard types and makes of watt-hour meters.

These switches have been examined and tested by the Underwriters' Laboratories and are approved and labeled as such.

An Improved Combination Surface Heater-Control Outfit.

The Bryant Electric Company, Bridgeport, Conn., has recently put on the market an improved design of surface heater-control switch particularly useful for installation in kitchens, pantries, laundries, etc., of the private residence or apartment building.

Combining in one a 10-ampere, 250-volt indicating switch, a Spartan concealed receptacle, and in parallel with it, an Edison receptacle for a pilot lamp, this is said to be the lowest-priced substantial heater control on the market. By means of a Spartan standard cap, which fits into the receptacle, current can be supplied for the electric iron, washing machine, and other current-consuming devices. The Spartan standard caps for use with this outfit have two parallel blades for making connection with phosphor-bronze spring contacts located in the slots well below the surface of the receptacle. Where polarized connection is desired, the unique construction of the blades insures insertion of the cap in only the correct way.

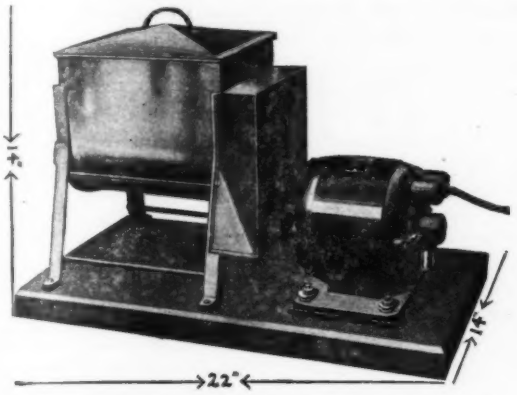
While the switch itself is of the indicating type, unmistakable visual evidence of the use of current is provided by the pilot lamp. The device is approved for use on concealed, cleat, or molding work. When used for concealed work, it can be attached, by means of four screws furnished, to any standard two-gang box as shown in the illustration. For cleat or molding work the wires are led into the base through the two holes provided in the end thereof. The cover is reversible, so that in cleat and molding work the feed may come from either the ceiling or the floor. Every provision has been made so that the device is as useful and foolproof as possible.

Combined Surface Heater Switch, Pilot Lamp and Receptacle.

Electrically Operated Cream Whipper.

The outfit illustrated is manufactured by the White-Stokes Company, Chicago, Ill., for whipping the Mallo topping made by this company. It is also suitable for whipping cream and other material. The outfit is very compact and can be operated in the window display.

This outfit consists of a one-gallon hopper which is equipped with a rotating beater or dasher. This dasher



Electrically Driven Cream Whipper.

is gear-connected to a one-eighth-horsepower motor made by the Robbins & Myers Company, Springfield, O. The motor is supplied with 10 feet of cord and plug for connecting to any lamp socket.

All gears and bearings of the whipper are made of bronze and no oiling is necessary. By removing a pin from the axle, the dasher can be lifted out for cleaning, and easy access is thereby given to the interior of the hopper.

Electrically Driven Combination Threading and Cutting-Off Machine.

The machine shown is one of a line of pipe and nipple machines developed by the Oster Manufacturing Company, Cleveland, O., to meet the demand for a pipe machine that would perform every one of the many pipe-threading jobs ordinarily required, using pieces long or short, straight or bent, over or under size, nipples of any length, and all-thread nipples.

This particular machine is for one-fourth to two-inch pipe. It is operated by a three-quarter-horsepower Westinghouse motor, which is mounted on the machine base and is direct-connected. It has ample power and speed for all classes of work. Machines for larger pipe are operated by larger motors, for instance, the machine for 2.5 to 8-inch pipe by a 2.5-horsepower motor.

This is a combination threading and cutting-off machine, as well as a combination pipe, nipple and bolt machine. It will thread bolts up to 1.25 inches. The regular standard equipment consists of motor, geared oil pump, automatic cut-off apparatus, automatic die release, and four sets of right-hand pipe dies from ¼ to 2 inches.

One of the great advantages of the machine is the open-type vise, which enables the operator to change the work quickly and thereby increase the capacity. Every operating part is right under the hand so that not a moment is wasted. Without changing his position, the operator can see the work of the threading dies at all times. The vise grips the work by a single turn of the wheel, bringing it to an absolute center. The vise can be moved up close to the die head for threading short pieces, short bends, nipples, bolts, and casings.

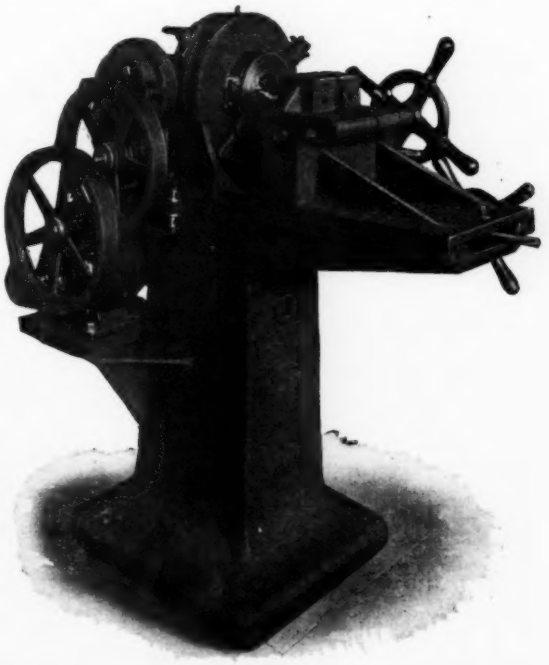
The quick die-release feature of the machine makes possible the opening of the dies at the instant the thread is finished. It opens the dies gradually and removes the burr, leaving a clean, perfect thread. At the same time, the vise carrying the pipe is thrown back, withdrawing the pipe from the die head. This contributes to faster and more perfect work, and insures duplication of the length of the thread. When adjusted for the length to be cut, it will repeat automatically without any atteniton on the part of the operator.

The threading dies are made of special steel and cut like a lathe tool. One set of dies will thread two or more sizes. The dies are controlled by a lever handle and are opened or closed by one movement of the hand while the machine is in motion. This handle is fastened to the die arm and is used in releasing the dies when the thread is cut, in setting them to same size for making duplicate threads, in changing the dies from one size to another, and in setting them to graduation on the face plates.

For threading close nipples the machine may be equipped with two threaded nipple holders which are attached to the front of the regular jaws by two bolts. The threaded end of the nipple is held in these holders while cutting a thread on the other end. When the thread is cut, the vise jaws are opened by a half turn of the hand wheel and the nipple drops out.

The cutting-off apparatus works automatically by means of a pawl attached to the frame of the machine. The cutter is set into the end of the sleeve and fastened with a screw. The star wheel is attached to a long screw which operates the sleeve holding the cutter. A ratchet attachment automatically regulates the feed of the cutter.

The oil pump is so arranged that no belt or chains are necessary to drive it. It is connected direct to the gears of the machine and operates constantly while the machine is in motion, thus insuring a steady and constant flow of oil to the dies. It is a combination pump and works both



Motor-Driven Combined Threading and Cutting-Off Machine.

ways, for right and left-hand threading. The oil is contained in a reservoir within the base of the machine. The pump lifts the oil from the reservoir and floods the dies and cutters, after which the oil is returned to the reservoir through a strainer, thus being used over and over without waste.

New Induction Relay for Selective Overload Protection.

The General Electric Company, Schenectady, N. Y., has recently placed on the market an induction-type time-limit overload relay which is particularly applicable to those systems where extreme accuracy in timing is required for tripping two or more air or oil circuit-breakers selectively.

The operating or characteristic curves for the various

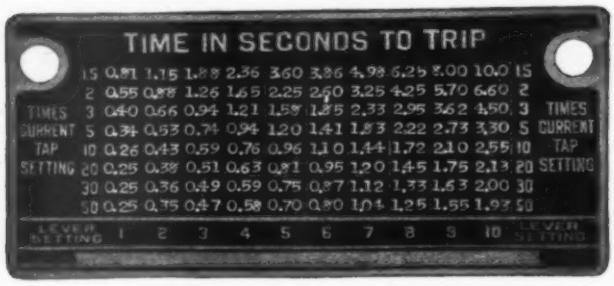


Fig. 1.—Index Plate of Relay for Time Delay Adjustment.

time-current settings are entirely separate and distinct at even the heaviest overloads and never become instantaneous. This is because of the inherent characteristics of the relay, which produce a curve consisting of an inverse-time portion up to approximately 2,000 per cent of minimum contact-closing current, blended into a definite-time portion with a slight downward slope. Consequently, the relay will do the work ordinarily required of both inverse and definite-time-limit relays. The heaviest overloads do not disturb the form of the curve, nor cause vibration or chattering of the moving parts.

The relay is made in single-pole elements, is circuit-closing, and operates with a time delay which is inverse for the lower current values and which approaches a definite minimum for the higher current values. It is designed for use in the secondary of current transformers, the normal load rating being five amperes. However, by means of the current-tap plate, the relay may be set for 4, 5, 6, 8 and 10 amperes, positive operation being obtained throughout this range.

The contacts are closed on overload by the rotation of a disk actuated by a U-shaped driving magnet with shading coils on the pole pieces. No tripping current is carried through the revolving parts. When the contacts have been

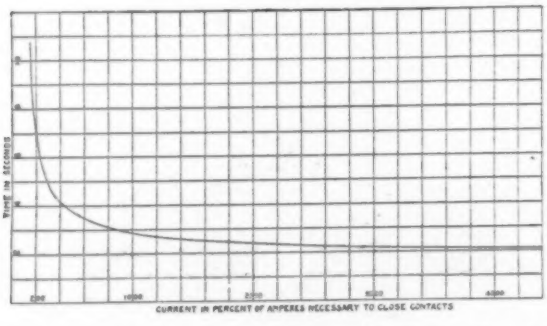


Fig. 2.—Characteristic Curve of Relay at Maximum Time Lever Setting.

closed they are firmly held in that position until tripping occurs, by the armature of a holding coil connected in series with the contacts, the trip coil of the air or oil circuit-breaker and an auxiliary switch which opens when the breaker is tripped. This insures current on the trip coil continuously until the circuit-breaker opens, and prevents flashing at the relay contacts.

The values given in vertical columns 1 to 10 on the index plate are the time delays which will be obtained at the different degrees of overload represented in the Times Current-Tap Setting columns at the extreme right and left sides of the index plate. The factors appearing in the Times Current-Tap Setting columns, when multiplied by the current-tap setting, represent actual secondary-current values.

To obtain a given current setting, it is only necessary to insert a tap plug in the current-tap plate at the desired current marking. Time settings are obtained by moving a small lever, in the front and near the top of the relay, to the column in which the desired time appears. For example, using current tap 6, it is desired that the relay be set to operate in 1.20 seconds with 120 amperes in the current transformer secondary; 120 amperes is 20 times current-tap setting 6. Referring to Fig. 1, in the horizontal row of the time values opposite factor 20, we find 1.20 seconds, the time desired, in vertical column 7. Therefore, in setting the time lever, the index point will be placed exactly over graduation mark 7 on the lever scale.

If the nature of the work is such as to require time settings intermediate to those given on the index plate, the proper time lever setting may be closely estimated or calculated by interpolation.

For a given time lever setting, the characteristic curves for all the current-tap settings are practically identical.

Fig. 3.—Inverse-Time-Limit Overload Relay.

Curves for consecutive time lever settings less time maximum, fall below the maximum curve shown in Fig. 2 in the same order as the settings.

The contacts are designed for use on direct current. They are made of a special metal which is non-corrosive and which has high heat resistance. They will carry 18 amperes momentarily without damage to the contact surfaces. The current-closing capacity is therefore ample to trip even the largest of the General Electric Company's circuit-breakers. A thermostatic device within the relay compensates for any variations in room temperature.

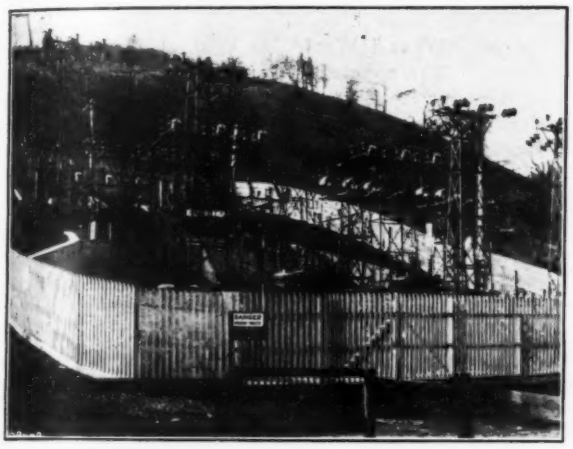
Following wattmeter construction, the movable element is supported by a jewel bearing, thus minimizing friction and eliminating vibration. A dustproof glass cover protects the operating parts of the relay and facilitates the reading of the index plate.

The relay is being furnished in two styles, one for 25 and one for 60-cycle circuits. Although the principle of operation and the inherent characteristics are the same in both relays, the relays themselves differ in slight details.

It is evident from the preceding that these relays possess numerous advantages not heretofore obtained in relay construction, and that all initial characteristics are as nearly maintained as is physically possible.

Outdoor Steel Substation of Low Construction and Operating Cost.

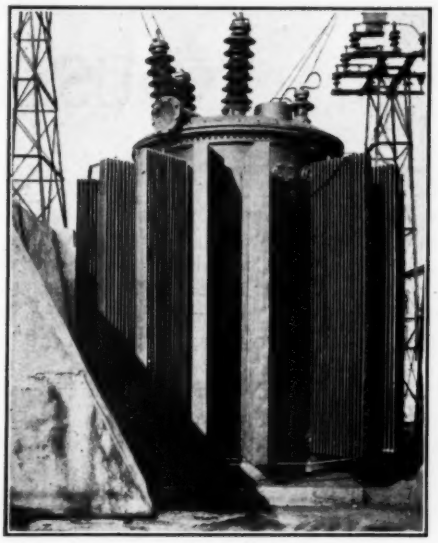
The substation of the Steubenville & East Liverpool Railway & Light Company, at Steubenville, O., is the first high-voltage outdoor steel substation to be installed in that thickly settled industrial district. The outdoor type of substation was decided upon due to the fact that the topographical conditions were such as to make the construction of an indoor substation prohibitive. As shown in the accompanying illustrations, the substation is situated on the side of a hill, the only suitable location that was available. To have made it of the indoor type would have made necessary a large building to house the equipment, and a large amount of excavating. By making it of the outdoor type excavation work was almost entirely eliminated by terracing the hillside with concrete foundations for supporting the steel structures for transformers, oil switches, lightning arresters, and other auxiliary apparatus. The cost was very much less than would have been the case had foundations for buildings been necessary. Less steel was used than would have been necessary to truss the roof of an indoor station of this size. The actual cost of the higher insulated weatherproof apparatus required was slightly higher than that of the indoor type, but this increase is almost negligible when compared with the cost of the entire station.



General View of Outdoor Substation at Steubenville, O.

This outdoor steel substation consists of two Westinghouse 1,500-kilovolt-ampere, three-phase, 60-cycle, 66,000/16,500-volt transformers of the latest self-cooling radiator type, together with the necessary protective equipment and switches so arranged that either of the transformers may be tapped to either of two incoming transmission lines. The transformers carry well over their rated load without exceeding the 40-degree centigrade temperature rise. Each is provided with a water-cooling coil for emergency use. With a circulation of 8.5 gallons of water per minute this transformer bank can carry between 5,700 and 6,000 kilovolt-amperes (or practically twice rated full load) continuously without exceeding a temperature rise of 55 degrees centigrade. Lightning protection is provided on the high-tension primary end by two sets of Westinghouse 66,000-volt, three-phase, electrolytic lightning arresters, and on the secondary end by arresters of the same type but for 16,500-volt operation.

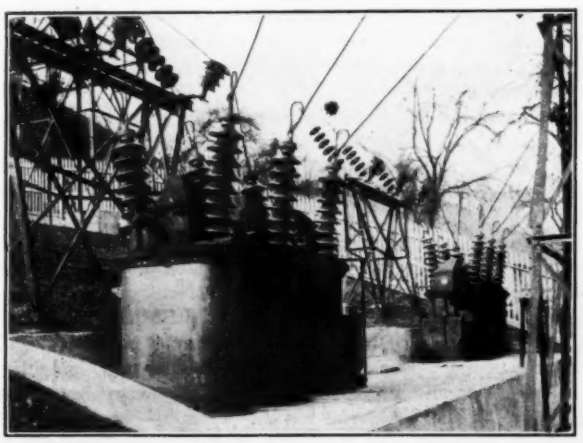
The substation receives current from a double-circuit, three-phase, 60-cycle, 66,000-volt steel-tower line of the Sunnyside Electric Company, one of the properties of the American Gas & Electric Company. These two lines are dead-ended on steel towers which carry choke coils and Burke outdoor disconnecting switches for disconnecting the oil circuit-breakers from the line. Five three-pole switches are provided between the circuit-breakers and the transformers, to sectionalize the installation so that either one or both transformers may receive power from either or both incoming 66,000-volt lines. The same system of switches is used on the secondary (16,500-volt) side of the station, so that energy may be delivered from this station to either or both transformers over either or both secondary lines, to the old power station, now a substation.



One of the Outdoor, Three-Phase, 66,000/16,500-Volt, Radiator-Type Self-Cooling Transformers.

A characteristic of outdoor substations in general, and one of the marked features in connection with this station, is that clearances are greatly increased, making for safety. There are few obstructions and straight-line work is possible. Due to the absence of entrance bushings, wiring can be easily kept out of reach of operators and the fire hazard reduced to a minimum.

This substation has proven very satisfactory and is liked because of the minimum amount of attention required, also on account of its simple and rugged construction, all of which indicates that very little repair work is necessary. Should it ever be required to move the substation it can easily be taken down as it was erected, and placed on a new site. The comparatively low first cost of the station is a very noticeable feature. The maintenance cost is also exceedingly low. Figures covering the cost of the station show that it has a low total cost of $4.55 per kilowatt. This should appeal to the operator accustomed to only indoor substations.



Two Banks of 66,000-Volt Electrolytic Lightning Arresters.

INDUSTRY ACTIVITIES

Vulcan Soot Cleaner Company, Du Bois, Pa., has issued a mailing folder descriptive of a treatise prepared by the company on boiler soot cleaning.

Harvey Hubbell, Incorporated, Bridgeport, Conn., has issued under date of October 2, trade discount lists on sockets, reflectors, lamp guards, attachment plugs, receptacles, etc.

Clarage Fan Company, Kalamazoo., Mich, manufacturer of multiblade fans, exhausters, blowers, etc., has established a branch office at 123 West Madison Street, Chicago, Ill., in charge of L. O. Monroe.

National Carbon Company, Cleveland, O., has prepared folders for the use of the electrical trade on the flame arc in motion-picture production, on Columbia waterproof battery boxes, and on the flame arc in photo-engraving.

Roller-Smith Company, 233 Broadway, New York City, announces that it is now represented in Seattle, Wash., by C. K. Hillman, Pacific Block Building. Mr. Hillman will handle Roller-Smith electrical instruments and circuit-breakers and Columbia meters in Washington, Alaska and parts of the state of Oregon and Idaho.

Nordberg Manufacturing Company, Milwaukee, Wis., announces the appointment of H. W. Dow as sales manager. Mr. Dow has been associated with the company in the engineering and sales departments for 12 years. The company builds steam and electric hoists, Corliss engines, poppet-valve engines, Uniflow engines, air compressors, oil engines and Nordberg-Carels Diesel engines.

Diehl Manufacturing Company, Elizabeth, N. J., has issued bulletin No. 601, on type "IS" (squirrel cage) and type "IW" (slip-ring or wound-rotor) polyphase induction motors. These motors are examples of the latest and most improved type of electrical and mechanical construction, and are built for severe service. The factor of rigid construction is doubly emphasized, insuring long life and efficient service.

Alpha Electric Company, Incorporated, 116 West Twenty-ninth Street, New York City, jobber and dealer in electrical supplies, has increased its capital stock from $25,000 to $50,000. The company has more than doubled its business during the past year and has made preparations for a continuance of the progress made. Additional floors have been acquired in its present building and by reason of the large stock on hand, the Alpha company is in an excellent position to meet the demand for increasing business. The officers of the company remain as follows: President, Michael Coleman; vice-president and treasurer, George E. Coleman; secretary, Albert F. Thacher, and general manager, James H. Hughes.

Inventor of S. K. F. Ball Bearing Visits American Factory.—Sven Winquist, of Gothenburg, Sweden, inventor of the S. K. F. ball bearing, visited the new American factory of the S. K. F. Ball Bearing Company at Hartford, Conn., during September. Mr. Winquist is president of the Swedish company and a trustee of the Connecticut company. After inspecting the factory Mr. Winquist expressed himself as pleased with the progress made. The American factory is already producing more bearings than its rated capacity and large additions to the present buildings will soon be necessary. The product of the American factory is of the same high quality for which S. K. F. ball bearings have always been justly famous. The raw material for the bearings—Swedish crucible steel—is imported and the same manufacturing methods are used at Hartford as in Sweden.

Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., has issued a booklet entitled "The Worker and the Works," descriptive of some of the employee's welfare activities participated in by the company and its employees.

Archer & Baldwin, 114 Liberty Street, New York City, have issued stock lists of turbine and engine-driven alternating-current generators, direct-current dynamos, and motor-generator sets. The machines listed are second-hand and are available for instant shipment.

National Lamp Works of General Electric Company, Cleveland, O., has issued a 160-page book called "How to Succeed as a Mazda Lamp Salesman." The book is prepared very attractively and, written in a popular style, contains many valuable sales suggestions in the contributions of a number of successful lamp merchandisers.

Western Electric Company maintained a booth at the New York Electrical Show, and each little girl passing the booth was given an illustrated folder inviting her to write a letter on "What I Would Do With a Junior Range If I Had One." The company will give one of these ranges to 10 girls under 12 years of age who write the best letters. A coupon is provided for sending in the parent's name to the company, giving a prospect list for local salesmen. The letters will be received by any dealer selling the Junior electric range.

The American Conduit Manufacturing Company, Pittsburgh, Pa., has issued advance copies of a mailing campaign, begun in September and to continue until December, on "Wiremold," the new two-wire metal molding placed on the market by that company recently. The campaign was started by sending out samples of the molding, accompanied by a descriptive letter, to contractors throughout the country, and followed up by post cards, sales letters, catalogs, descriptive matter, etc., all mailed or to be mailed to the electrical trade on definite days during the four months.

The Anderson Electric Car Company, Detroit, Mich., manufacturer of Detroit Electric vehicles, has purchased the Chicago Electric branch of the Walker Vehicle Company, and on November 1 will take over all new Chicago Electrics completed and those in process of manufacture, together with all service parts. The sale of Chicago Electrics, as well as all service parts, will be handled from the Chicago branch of the Anderson Electric Car Company. The extensive service facilities of the Anderson people will assure all present and future owners of Chicago Electrics the best service and attention. All unexpired warranties and service contracts on Chicago Electrics will be honored by the new selling organization after November 1. Gail Reed, of the Walker Vehicle Company, with others of the Chicago Electric sales organization, will join the Anderson company's organization. The Walker company is a pioneer in the manufacture of commercial electric cars. The large fleets of its cars that have been in service for several years have through economy and satisfaction brought a great increase in business, making it expedient to confine the entire efforts of its factory and organization to the commercial electric field. The opinion is expressed that this transaction will prove one of the most important moves made in the interest of present and future users of both types of electric cars.

PERSONAL AND BIOGRAPHICAL

MR. ROBERT W. ROLLINS, the newly elected president of the New England Section, N. E. L. A., is a solid factor in the central-station industry of that section of the country. He was born in Newbury, Vt., in 1864 and his early education was obtained in the common schools of his native town and in Newbury Seminary. At the age of 21 he entered the employ of the Hartford (Conn.) Electric Light Company as a general utility man. Later he took a complete practical course in the factory of the Schuyler Electric Company, of Hartford, manufacturer of dynamos, returning after a year to the central-station company as operating engineer of its generating plant. Mr. Rollin's next connection was with the Waterhouse Electric Manufacturing Company, of Hartford, for whom he installed lighting plants. The Waterhouse company being absorbed by the Westinghouse Electric & Manufacturing Company, Mr. Rollins went with the latter company as district engineer of the Boston office. A year later he returned to the Hartford Electric Light Company as assistant superintendent, afterwards becoming general manager. In 1911 he accepted an offer from the Worcester Electric Light Company to become its general manager, and on his acceptance of the office was elected to the presidency of the company, which two offices he now holds. Mr. Rollins is a director in the Hartford Automatic Refrigerator Company, a member of the executive committee of the Massachusetts Electric and Gas Association, a member of the Worcester Chamber of Commerce and the Commonwealth and Worcester Country Clubs. He was treasurer of the New England Section four years and has been vice-president during the past year.

R. W. Rollins.

MR. GAIL REED, general sales manager and advertising manager of the passenger car division of the Walker Vehicle Company, whose line of Chicago Electric cars has been purchased by the Anderson Electric Car Company, of Detroit, Mich., will become a member of the latter company's organization November 1. Mr. Reed has been active in the electric car industry for more than 10 years, having been prominent with the Woods Motor Vehicle Company, and subsequently was first to open up an extensive selling organization for electrics in Kansas City. He subsequently handled the Ranch & Lange electric car and was manager of the Detroit Electric branch in Kansas City. In 1912, when the Chicago Electric Motor Car Company was organized, Mr. Reed held an executive sales position and secretaryship until the company was taken over by the Walker Vehicle Company. Mr. Reed always has been active in association work of the electric vehicle industry. He was elected president of the Chicago Electric Garage and Dealers' Association in 1915, and was a member of the executive board of the Chicago Section, Electric Vehicle Association, for two years. At present he is chairman of the garage and rates committee of the Chicago Electric Vehicle Section, N. E. L. A., member of the Mid-West Section of the Society of Automobile Engineers, and the Jovian Order. Mr. Reed can justly be called one of the pioneers of the electric vehicle industry. His experience, dating from the early days of the automobile industry, has covered every phase of the business to the present day.

Gail Reed.

OBITUARY.

MR. C. A. LITTLEFIELD, general secretary and a charter member of the Illuminating Engineering Society, died at his home in New York City, October 22, aged 48 years. Mr. Littlefield was general agent of the New York Edison Company, with which he had been connected for 25 years. He was a member of the National Electric Light Association, the National District Heating Association, the American Museum of Safety, and was a director of the New York Edison Savings and Loan Association, as well as a member of several other civic and national organizations. He is survived by his widow.

MR. HARRY H. GRIBBEN, superintendent of the Oakland (Cal.) factory of the Standard Underground Cable Company, died September 25, at his home in Oakland, aged 56 years. Mr. Gribben was a native of Pittsburgh, Pa., and lived there until 1899 when he moved to California to take charge of the factory which the Standard company had then just completed. Previous to this he was general foreman in the company's Pittsburgh factory. He had been in the employ of the Standard company for over 30 years and was one of its most faithful, loyal and competent superintendents, and a man who by his personal qualities endeared himself not only to his business associates, but to everyone with whom he came in contact.

MR. WILLIAM WARD HINCHER, Chicago manager of Albert & J. M. Anderson Manufacturing Company, with Mrs. Hincher was instantly killed in an automobile accident on October 18, near Shelby, Ind. Mr. and Mrs. Hincher had left Chicago early that morning and were en route to the convention of the Jovian Order at Indianapolis when the tragedy occurred. The news of the accident came as a great shock to his many friends who were already in Indianapolis and also to those in Chicago and elsewhere where he is highly esteemed. Mr. Hincher was born on July 18, 1876, at Burr Oak, Mich., and for a number of years resided in Muskegon and Sturgis, Mich., respectively. He moved to Chicago on December 26, 1898, and at that time married Miss Marie I. Kirlin. Mr. Hincher became connected with the Chicago City Railway Company on his arrival in Chicago and at the same time attended night school at Lewis Institute. Later he accepted a position with the Anderson company and remained as its representative until the time of his death. Mr. Hincher was active in many clubs and organizations in Chicago and of national character, and was high in Masonic circles. He is survived by his father and his sister, who is the wife of S. B. Cushing of the Public Service Company of Northern Illinois.

W. W. Hincher.

CURRENT ELECTRICAL NEWS

Weekly Record of Construction Activities

EASTERN STATES.

RUMFORD, ME.—A charter for the construction of the Rumford Falls & Bethel Street Railway has been granted by the Legislature and it is proposed to issue $200,000 in stock and bonds, the proceeds of the bond and preferred stock issue to build and equip the road, and $50,000 to pay for organization services, surveys, right of way and financing.

FRANKLIN, N. H. — A water-power privilege and 200 acres of land on Smith River at Profile Falls have been acquired by Byron B. Tobie and others, with a view to improving the property and installing a generating plant.

NASHUA, N. H.—The Bay State Street Railway Company will extend its lines to the Country Club.

PORTSMOUTH, N. H.—The generating station of the Rockingham County Light & Power Company is undergoing important improvements and additions. Cushman Brothers Company, of Newburyport, Mass., are the general contractors.

BARRE, VT.—A new corporation, the Central Power Corporation of Vermont, has been organized and has filed a certificate with the Secretary of State which indicates that it intends to develop water-power rights on Middlebury River and construct generating plants. The capital stock is $1,000,000.

PITTSFIELD, MASS.—The contract for the foundations of a new power plant for Monument Mills has been awarded to F. T. Ley & Company, Springfield, Mass.

NEW HAVEN, CONN.—It is reported that the United Illuminating Company has acquired a tract of land near the Lake Whitney dam, where a generating plant will be erected.

WINSTED, CONN.—The Winsted Gas Company is reported to be considering the construction of a large electric power plant on South Main Street, where the company has acquired about eight acres of land.

PROVIDENCE, R. I.—Representatives of the Connecticut River Power Company are acquiring pole rights through East Providence. It is reported that a line to Fall River, Mass., is contemplated.

LA SALLE, N. Y.—The Suburban Power Company, of Niagara Falls, is making extensions to its local distribution system.

LIVONIA, N. Y.—The Board of Trustees has signed a two-year contract for the operation of the street-lighting system with the Livonia Light & Heat Company, with offices in Avon.

NEW YORK, N. Y.—A power house costing $40,000 is to be erected by the Interborough Rapid Transit Company from plans by its architect, George H. Pegram, on 139th Street near Alexander Avenue. It will be a 60-by-100-foot, one-story structure.

RANSOMVILLE, N. Y.—A petition is being circulated for the establishment of a street-lighting district, and if approved the Lewiston & Lake Ontario Shore Power Company will install 30 units.

JERSEY CITY, N. J.—On October 17 fire partially destroyed the coal-conveying plant at the power station of the Public Service Electric Company, foot of Duffield Avenue, including motors, conveyor and other machinery. The plant will be rebuilt at once.

LAMBERTVILLE, N. J.—The Belvidere Delaware Railroad Company will build a new 20-wire telegraph and telephone line. A new pole line is being installed.

MORRISTOWN, N. J.—The Morristown & Erie Railroad will electrify its system from Morristown to Essex Falls. Electrical energy will be obtained from the Morris & Somerset Electric Company. An addition will be made to the company's roundhouse at Morristown to be used as a transformer station.

NEWARK, N. J.—The Common Council will receive bids up to November 3 for electrical work, lighting fixtures and other equipment for one of the city buildings on Franklin Street, and for the new police headquarters to be erected on Franklin Street.

TRENTON, N. J.—The Lakewood & Coast Electric Company has been granted permission by the Board of Public Utility Commissioners to issue capital stock for $19,500 and first mortgage bonds for $20,000, to be used for extensions.

JONESTOWN, PA.—The Bunker Hill Electric Company has been incorporated with a capital of $5,000. D. S. Martin, of Reading, Pa., is treasurer of the company.

HARRISBURG, PA.—The installation of 44 single-lamp standards in North Third Street has been authorized by the City Council. The installation will be made by the Harrisburg Light & Power Company, which will also furnish service.

PHILADELPHIA, PA.—The Bureau of Charities will receive bids up to November 6 for electrical work in new buildings to be constructed for the Philadelphia Institution for Feeble-Minded, Byberry. Wilmer Krusen is director.

SHILLINGTON, PA.—The directors of Burks County Almshouse have under advisement the establishment of an electric-lighting plant.

YORK, PA.—The Edison Light & Power Company is preparing plans for the installation of a new street-lighting system here, the 250-candlepower units to be replaced with 400-candlepower nitrogen-filled units. Part of the equipment for the new system has already been purchased.

WASHINGTON, D. C.—Progress is being made on the test holes being bored at the site in the vicinity of the heating and light plant the Government authorities propose to build at the foot of Fourteenth Street, S. W. Fourteen holes will be bored for testing purposes.

AUGUSTA, GA.—It is reported that application will be made to the City Council by R. J. Edenfield and associates for a franchise to erect and operate an electric light and power system here.

FOLKSTON, GA.—The City Council is planning the installation of an electric-lighting system to cost about $1,500.

LAKE BUTLER, FLA.—A proposition to issue $10,000 in bonds for the installation of an electric-lighting plant will be voted on at an election to be held November 9.

MOORE HAVEN, FLA.—Harry Lawton, of Miami, Fla., and others have organized a company to establish an electric-lighting system and ice plant here.

NORTH CENTRAL STATES.

ANDOVER, O.—The Andover Electric Light & Power Company has been organized with a capital of $15,000 by C. E. Harmon, C. W. Wood and others and will furnish electric service here.

CINCINNATI, O.—A permanent lighting system, of the ornamental or boulevard type, is proposed for the new viaduct on Hopple Street, recently completed and thrown open to traffic. It is estimated that a lighting system could be installed for $13,000.

CINCINNATI, O.—A new plant is to be constructed here by the Champion Tool Works, according to President H. W. Kreuzberg, costing about $100,000. A considerable amount of power and electrical equipment will be called for in the building, which is to be of the modern factory type. Construction will not be started before next spring.

COLUMBUS, O.—The Wilson Avenue Improvement Association is making plans for the installation of a boulevard lighting system on Wilson Avenue.

COLUMBUS, O.—The Ohio State Telephone Company proposes to spend $400,000 for improvements in Columbus and in Franklin County. Part of the outlay will be for two new mains, one extending to the extreme eastern part of the city and the other to the extreme western. New exchanges, underground cables and minor extensions are other items. The work is contingent upon authority being granted to issue and sell at par $2,000,000 of its authorized preferred stock of $10,000,000.

BROWNSTOWN, IND. — The Jackson County Transmission Company has been incorporated with a capital of $15,000 to furnish electric service in this vicinity. Earl F. Reagan is interested in the company.

DANA, IND.—The Public Service Commission has authorized the town of Dana to sell its municipal electric-lighting plant to the Clinton (Ind.) Electric Lighting & Power Company for $6,000.

FRANKFORT, IND.—Esterline & Angus, consulting engineers, Indianapolis, Ind., have been selected to design and supervise the erection of an entire new manufacturing plant for the McDougall Kitchen Cabinet Company, of this city. This will include the design of the building, the selection of equipment, heating, ventilating and power installations. Electric drive will be used throughout the plant. The same engineers are also preparing plans and will supervise the installation of power equipment for a new plant for the Ingram-Richardson Company, manufacturer of metalware.

LAPORTE, IND.—The County Commissioners have awarded the contract for the construction of a new lighting and heating plant to the Larson-Danielson Construction Company on its bid of $16,200.

SEYMOUR, IND.—The Interstate Public Service Company has made contracts to furnish electrical energy to the towns of Brownstown, Vallonia and Medora from its local power plant. Twenty-four-hour service will be provided.

GENESEO, ILL.—The Almo Engineering Company, of Omaha, Neb., has prepared plans for the local municipal electric lighting plant.

HEBRON, ILL.—The L. E. Myers Electric Company, which has been granted an electric franchise here, has changed its name for this city to the McHenry County Electric Light & Power Company.

HILLSBORO, ILL.—The Saline County Electric Company, of this city, has announced the purchase of the holdings of the Duquoin (Ill.) Utility Company and the Pinckneyville (Ill.) Utility Company. It is reported that Saline County company is negotiating for the purchase of the public utilities at Sparta, Eldorado, Chester and Nashville, and in all probability they will be taken over this week. The officers of the Saline County Electric Company are the same as those of the Southern Illinois Light & Power Company, of Hillsboro.

JOLIET, ILL.—Plans for the electrification on the main plant of the city waterworks are being prepared for consideration by the City Council.

MURPHYSBORO, ILL.—The contract for the new light and power plant to be erected here has been awarded. The new plant will cost in the neighborhood of $100,000.

ALLEGAN, MICH.—Taxpayers of this city will vote on a proposition to bond the city for $6,000 for a municipal street-lighting system.

GRAND RAPIDS, MICH.—A loan of $10,000 has been authorized for the city lighting fund, to be used as needed for the installation of 100 new arc lamps.

WHITEHALL, MICH. — Preliminary plans have been made for the organization of the White River Power & Light Company, capitalization of which will be $500,000. The company has built a dam at Ferry, Mich., and a transmission line from Ferry to Hesperia, Mich., and other lines will be erected to Montague and Whitehall, where 24-hour electric service will be furnished.

BOSCOBEL, WIS.—The City Council has prepared plans for improving the local street-lighting system.

PLATTEVILLE, WIS.—The Interstate Light & Power Company, of Galena, Ill., which operates here, is making improve-

ments to the local distribution system at a cost of about $5,000.

WOODSTOCK, MINN.—J. W. Pierce is making preparations for extensions to the local electric distribution system.

JEFFERS, MINN.—The City Council has made arrangements for the installation of a street-lighting system, energy to be supplied from the plant at Lamberton, Minn.

MARSHALLTOWN, IOWA.—The Iowa Railway & Light Company has made application to the Board of Supervisors for the right to erect transmission lines on certain public highways in Marshall County.

SCRANTON, IOWA.—The Iowa Light & Power Company has purchased the holdings of the Scranton-Glidden Electric Company, of this city. The latter company was organized about four years ago with a capital stock of $10,000.

WHAT CHEER, IOWA.—A 25-year franchise has been granted to the Burlington Railway & Light Company for the operation of a street-lighting system which will be installed at an estimated cost of $5,000.

WATERLOO, IOWA.—Work on the new power plant being erected by the Citizens Gas & Electric Company is progressing rapidly. The excavation work has been nearly completed and some of the concrete foundation has been poured. H. A. Maine & Company are doing the work.

ASH GROVE, MO.—With the sale recently of the Ash Grove lighting plant under foreclosure, plans are now being made for the erection of a modern building and the installation of new generating equipment.

JOPLIN, MO.—J. F. Lee, Commissioner of Public Utilities, has announced that he will ask the City Commission to call a special election to vote on the proposition of issuing bonds for the erection of a $175,000 municipal electric-lighting plant.

KANSAS CITY, MO.—The Kansas City Light & Power Company has been given the privilege of entering any part of Wyandotte County, Kans., outside of Kansas City, Kans., to supply customers with energy for light and power. Power customers, however, cannot be served within two miles of the limits of the latter city. It is reported that the light and power company had originally planned to locate its big power plant in Wyandotte County, the site of which has not been announced.

POWERSVILLE, MO.—The Powersville Electric Light & Power Company has been organized with a capital of $3,000 by I. O. Pollock, G. H. Scott and J. W. Bowan to provide electric light and power in this city and vicinity.

ST. LOUIS, MO.—The Ways and Means Committee of the Board of Aldermen has recommended the passage of a bill appropriating $12,500 for a survey to determine the feasibility of erecting a municipal electric-lighting plant.

BANCROFT, NEB.—Bonds in the sum of $12,000 will be issued for the installation of an electric-lighting system here.

BEATRICE, NEB.—The proposition to issue $25,000 bonds for the erection of an electric-lighting plant here was defeated at an election held last week.

WOLBACH, NEB.—Plans are being prepared by the Martz Engineering Company, Orpheum Building, Lincoln, Neb., for the construction of a power plant and distribution system here to cost $10,000.

BRUCE, S. D.—The City Council has called a special election, to be held October 31, at which a proposition of issuing bonds in the sum of $7,000 for the installation of an electric-lighting system will be submitted to the voters.

BUSHNELL, S. D.—The Dakota Light & Power Company has been granted a franchise to furnish electric light and power to this city.

BEACH, N. D.—W. V. Hughes is negotiating for the purchase of the Beach Electric Company, which probably will be granted a new 20-year franchise for operation here.

MEDINA, N. D.—The installation of an electric-lighting plant is under construction. E. P. Olson is interested in the project.

SOUTH CENTRAL STATES.

LEXINGTON, KY.—The Lexington Utilities Company is installing a number of sample street lamps of various types so that the city officials, under the contract with the company for street lighting, may make a selection. The samples are of the nitrogen-filled type.

LUDLOW, KY.—The City Council has passed to its first reading an electric-lighting ordinance which provides furnishing electrical energy for street lamps and private consumption. The franchise with the Union Light, Heat & Power Company, of Cincinnati, expired several years ago, since which time energy has been furnished to the city without a specific contract.

MIDDLESBORO, KY.—The Kentucky Utilities Company is completing extensive improvements at its plant at Varilla which will increase the capacity of the plant.

BEARDEN, TENN.—The construction of a hydroelectric plant and water pumping station on one of several sites is proposed by the Bearden Welfare Association, which is taking the lead. The estimated cost is $5,000. Dr. M. H. Lee is president of the association. J. A. Switzer, of the University of Tennessee, is preparing a report on the inspection.

BRISTOL, TENN.—Work has been commenced on the construction of a dam crossing the Holston River at Emmetts, six miles from this city. The Bristol Traction Company has the work in hand and proposes to develop power for the operation of its street cars here. It is reported that additional power developments will also be made by the company.

CARTHAGE, TENN.—The Smith County Electric Company, recently incorporated and organized with $20,000 capital, will construct a power plant at a cost of $20,000, to develop 500 horsepower and to supply Carthage and South Carthage. The estimated cost of the distribution system is $5,000. R. S. Seese, of Carthage, is engineer, and T. B. Read is secretary-treasurer of the company.

CLARKSVILLE, TENN.—The County Court has appropriated $1,500 toward the equipment of a lighting plant for the Shelby County Industrial and Training School, near Ellendale, Tenn.

MEMPHIS, TENN.—The City Commissioners have voted to advertise for bids on $1,500,000 bonds authorized under an act of the last Legislature, to be used for the purchase or erection of a municipal electric-lighting plant.

MONTGOMERY, ALA.—The Montgomery Light & Traction Company is interested in a movement to construct an electric railway from Montgomery to Wetumpka, Ala., about 15 miles.

GILLETT, ARK.—A 50-year franchise has been granted to the Stuttgart (Ark.) Public Service Company for furnishing electric service here. The company will erect a modern plant as soon as plans are prepared.

HOT SPRINGS, ARK.—United States Engineer Marshall, who in 1902 recommended to the War Department that a survey of the Ouachita River be made to ascertain the water power that could be developed, has made an inspection of that river at Bull Bayou and of the site for the proposed government nitrate plant at Cedar Glades. Inspection was also made of the Narrows at Malvern.

WALDRON, ARK.—The Waldron Power & Ice Company will erect an electric-lighting system and a five-ton plant. J. S. Hill is interested in the project.

DATES AHEAD.

American Mining Congress. Hotel La Salle, Chicago, Ill., November 13-18. Secretary, J. F. Callbreath, Denver, Colo.

Electric Power Club. Hot Springs, Va., November 15-18. Secretary, C. H. Roth, 1410 West Adams Street, Chicago, Ill.

Ohio Society of Mechanical, Electrical and Steam Engineers. Annual meeting, Columbus, O., November 16. Secretary, F. E. Sanborn, Ohio State University, Columbus, O.

Association of Railway Electrical Engineers. Annual convention, Hotel La Salle, Chicago, Ill., October 31 to November 3. Secretary, A. J. Andreucetti, Chicago & Northwestern Railway Company, Chicago, Ill.

Kansas Public Service Association. Annual meeting, Topeka, Kans., December 7-8. Secretary, E. A. Wright, Manhattan, Kans.

American Institute of Chemical Engineers. Annual convention, New York City, January 10-13, 1917. Secretary, J. C. Olson, Cooper Union, New York, N. Y.

American Association for the Advancement of Science. Annual meeting, New York City, December 26-30. Permanent secretary, L. O. Howard, Smithsonian Institution, Washington, D. C.

MOUNTAIN VIEW, OKLA.—Plans are being made to install an electric-lighting plant here. The city has been authorized to issue $8,000 in bonds for this purpose.

CUMBY, TEX.—George Holland has purchased the electric-lighting plant here from Jesse English and O. B. English.

DALLAS, TEX.—The City Commission has added one cent on the $100 valuation to the tax apportionment for the street-lighting fund, making available $13,000 for the installation of additional street lights.

GROVETON, TEX.—The Groveton Light & Ice Company has just installed a new engine in its electric-lighting plant.

HOUSTON, TEX.—The Houston-Richmond & Western Electric Railway Company has awarded the contract for the construction of the first 60 miles of its interurban electric railway to J. H. Berryman & Company, of Houston. The proposed road is to run between Houston and San Antonio, a distance of about 225 miles.

LAMESA, TEX.—The Lamesa Light & Power Company has been incorporated here with a capital stock of $6,000 for the purpose of building and operating an electric-lighting plant. The incorporators are E. F. Cox, R. B. Red and N. C. Lindsey.

MISSION, TEX.—The Mission Light & Water Company has increased its capital stock from $20,000 to $40,000 and will make improvements to its plant.

SAN SABA, TEX.—Frank Hall and associates will install a new 100-horsepower engine in their electric-lighting plant here.

TERRELL, TEX.—The contract entered into by the City Council for the sale of the municipal electric-lighting plant to the Texas Power & Light Company, of Dallas, for a consideration of $55,000, will be submitted to a referendum vote of the taxpayers for ratification.

WESTERN STATES.

MELSTONE, MONT.—H. A. Amborg has been awarded a contract for constructing a municipal electric-lighting plant here. Generating equipment has not yet been purchased.

CHLORIDE, ARIZ.—J. E. Terral, of the Chloride Electrical Supply Company has announced that he has wired 250 houses in anticipation of the electric service which will be furnished here by the Desert Power Company.

DOUGLAS, ARIZ.—Ornamental lights to be installed in the G Avenue and Tenth Street districts will cost the city about $12,500, according to estimates submitted by the city engineer.

DUNCAN, ARIZ.—J. P. Oberholser and C. E. Adams are now the owners of the local electric-lighting plant, Mr. Adams having purchased J. E. Allen's half interest. The new owners plan extensive improvements.

TOMBSTONE, ARIZ.—The survey of a new toll line of the Mountain States Telephone & Telegraph Company has been completed and four crews will be put to work at once on the construction.

SALT LAKE CITY, UTAH.—Engineers in the employ of a large electrical manufacturing company and of the Denver & Rio Grande Railway will make a survey of the Denver & Rio Grande from Salt Lake City to Grand Junction to obtain estimates on the cost of the electrification of the Utah main line of the road. In addition, the engineers will make a survey of the Soldier Summit hill to secure estimates on the electrification of that part of the road. The work of the engineers does not mean that the railway will be electrified soon, but the data secured will be used to show that the operating expenses could be cut down materially if electricity was used as a motive power. Reports have been current for two years that the Denver & Rio Grande would in all probability electrify the Utah lines, but this is the first actual step to be taken by the company.

BOISE, IDAHO.—The City Council has accepted the bid of the Electric Supply Company to install the new municipal lighting system. The amount of the bid was $3,371.

DEER PARK, WASH.—The Deer Park Lumber Company has applied to the County Commissioners for a franchise to construct an electric light and power line along the road entering Deer Park from the lumber company's plant.

HILLYARD, WASH.—The city will probably call for bids in the near future for electrical energy for light and power used by the city. The Washington Water Power Company, of Spokane, now furnishes energy here, but is not under contract.

PASCO, WASH.—The Pacific Power & Light Company has made application to the Franklin County Commissioners for a franchise for the construction and maintenance of transmission lines for furnishing electricity in Franklin County.

PE ELL, WASH.—The North Coast Power Company, which operates a network of power lines throughout Southwestern Washington, is considering plans for the establishment of a power plant here. It is estimated that a plant of sufficient capacity would cost about $17,000.

SPOKANE, WASH.—Plans are being made by the Great Northern Railway for the electrification of more than 300 miles between Spokane and Seattle and through mountain divisions in the West. The project is tentatively outlined as one of the largest of its kind ever to be undertaken. The Great Northern, through a subsidiary company, controls water rights on the Chelan River in Washington and the present plans, it is reported, include the raising of the level of Lake Chelan, near which the main power plant would be established. It is understood that the actual preliminary work of the project will be started by next summer.

SUNNYSIDE, WASH.—The City Council has granted a franchise to the Pacific Power & Light Company to construct and operate power lines in this city.

KLAMATH FALLS, ORE.—A special election is called for November 14 to vote on the granting of a franchise to the Reno (Nev.) Power Company to furnish light and power to the city.

MARSHFIELD, ORE.—Manager A. L. Martin, of the Oregon Power Company, has been authorized to install a new transmission line between the company's substation at Porter and the C. A. Smith mill. The work will cost about $18,000.

BAKERSFIELD, CAL.—The Southern Sierras Power Company has been granted a 50-year franchise to erect poles and electric lines along the highways in portions of Kern County.

FRESNO, CAL.—The city will erect its own lighting system for the Court House Park. All the bids received were rejected at a recent meeting.

LOS ANGELES, CAL.—The City Council has ordered ornamental lights for Washington Street between Main and Central Avenues.

LOS ANGELES, CAL.—The McEwan Efectric Company was awarded the contract for the installation of a lighting system on Hollywood Boulevard between Cherokee and Wilcox Avenues.

LOS ANGELES, CAL.—The Board of Supervisors will receive bids up to November 6 for the installation of electrical systems in various buildings to be erected on the grounds of the Los Angeles County Hospital.

LOS ANGELES, CAL.—The State Railroad Commission has denied the city of Los Angeles a rehearing on its decision fixing $6,328,000 as just compensation to be paid by the city for the power system of the Southern California Edison Company.

LOS ANGELES, CAL.—The Board of Supervisors has issued an order that an ornamental lighting system be installed in the Athens-on-the-Hill district which lies west of Main Street. The district east of Main Street, in which ornamental lamps were opposed, will have arc lamps.

OAKDALE, CAL.—The Sierra & San Francisco Power Company will erect a new substation in F Street.

RICHMOND, CAL.—The city will obtain electrical energy for lighting at a reduction of 12 per cent from the present charge, according to an announcement made to the City Council by C. M. Brewer, manager in Richmond for the Western States Gas & Electric Company.

SANTA BARBARA, CAL.—The City Council has decided upon ornamental metal standards for the State Street lighting system. There will be ten posts to the block.

VISALIA, CAL.—The Board of Trustees has passed a resolution of intent to construct a conduit for conducting electrical energy along certain streets of their city. It also passed a resolution to construct foundations for electroliers.

Proposals

LIGHTING SYSTEM.—Bids will be received until November 9 by Herbert M. Myers, 333 Chamber of Commerce Building, Columbus, O., secretary of the Ohio State Board of Public Buildings, for furnishing labor and material for lighting and decorating the Ohio state capitol at Columbus.

LIGHTING EQUIPMENT.—Sealed bids for the furnishing of lamps and the necessary maintenance of the same for the illumination of public highways and public places of the village of Pleasantville, O., will be received by the clerk of said village, November 11. I. H. DeRolph, Clerk.

ALTERNATORS.—Sealed bids will be received by the city of Chicago, Ill., 406 City Hall, November 10, for furnishing and erecting complete at the municipal power plant two 3,000-kilowatt turbine-driven alternators, with condensors, circulating pumps, air pumps, condensate pumps, transformers, and accessories, according to plans and specifications on file in the office of the Department of Public Works.

ELECTRIC-LIGHTING SYSTEM.—Bids will be received for the building of the electric-lighting system at Bertrand, Neb., until November 6. Separate bids will be received for furnishing all material and labor required to make additions to building and including generator foundation: for furnishing pole-line material: for furnishing one 35-kilowatt, three-wire, 220-volt, direct-current generator; one 58-cell, 280-ampere-hour storage battery; one two-panel switchboard, and one 12-inch, double leather belt, 50 feet long, made endless. Plans and specifications are on file with the village clerk, and also with the Alamo Engine & Supply Company, engineers, Omaha, Neb.

ELECTRICAL SUPPLIES.—Bids will be received at the Bureau of Supplies and Accounts, United States Navy Department, Washington, D. C., for furnishing supplies at the following naval stations: Schedule 289, various navy yards, 9,300 ¼-inch to ⅞-inch spark-plugs. Schedule 294, Puget Sound Wash., six 220-volt, alternating-current motors. Schedule 297, Puget Sound, Wash., 285 pounds of 20 by 48-inch hard-rubber sheets. Schedule 297, Mare Island, Cal., 1,000 five-candlepower instrument lamp-sockets. Schedule 301, Brooklyn, N. Y., 12 ½-inch portable electric drills. Schedule 305, Brooklyn, N. Y., miscellaneous interior communication cable, 10,500 feet of telephone cable, 12 portable double-scale voltmeters, and miscellaneous twin-conductor wire. Bidders desiring to submit proposals should make application immediately for schedules to the Bureau, or to the purchasing office nearest to navy yard where delivery is to be made.

Foreign Trade Opportunities

[Addresses may be obtained from the Bureau of Foreign and Domestic Commerce, Washington, D. C., or its offices at Boston, New York, Atlanta, Chicago, St. Louis, New Orleans, Seattle and San Francisco. Write on separate sheet for each item and give file number.]

NO. 22,567. ELECTRICAL APPLIANCES, ETC.—A wholesale importing house in Mexico dealing in machinery and electrical appliances desires to represent American manufacturers of electrical appliances, materials, machinery and supplies of all kinds. The firm is particularly interested in switchboards, insulators, transformers, heating devices, lamps, glassware and fixtures for house lighting. References.

NO. 22,522. ELECTRICAL GENERATORS AND TURBINES. A Norwegian engineering firm has advised an American consular officer that it desires to communicate with American manufacturers of electrical generators and electrical and steam turbines. Catalogs, price lists and full information should be sent. Correspondence may be in English.

NO. 22,541. ELECTRICAL APPARATUS.—A manufacturers' agent in Cuba desires to represent American manufacturers of electric motors, transformers and electrical apparatus and supplies of all kinds.

ELECTRICAL APPLIANCES.—On account of the fact that coal is not now obtainable in Venezuela at a reasonable price, and that wood fuel is uncertain, the owners of sawmills, grist mills, hat factories, bakeries, printing establishments, and numerous other small industries have shown increasing interest in electric power and heating devices. There is a good opening for all kinds of electrical appliances for domestic and industrial use, such as fans, stoves, irons, large ovens for bakeries, motor-driven pumping outfits for private houses, motors of 1 to 25 horsepower, etc. The Maracaibo Electric Light Company will be pleased to receive catalogs and prices of all these lines, and will order through New York commission houses. To get orders in this market prices must be given in the first correspondence.

Financial Notes

The Empire Gas & Electric Company has been authorized by the New York up-State Public Service Commission to sell $61,000 5-per-cent bonds at 90, the proceeds to be used to increase its generating and distributing facilities.

The Illinois Public Utilities Commission has authorized the Illinois Northern Utilities Company to issue $750,000 first and refunding bonds. The Commission has also authorized the Evanston Railway to issue $444,800 first and general mortgage bonds to the Merchants Loan & Trust, trustee.

The Missouri & Southeastern Utilities Company, comprising the electric light and power plants in Caruthersville, Hayti and Kennett in Missouri, and Blythesville, Rector and Diggott in Arkansas, have been sold to John H. Watkins, of New York. The sale was negotiated by Arthur D. Lord.

The proceeds of the proposed issue of $4,583,900 of new Commonwealth Edison stock to stockholders at par will be used to defray the cost of the company's extension program. It is expected that the new shares will be issued as of February 1, 1917, increasing the amount of stock now outstanding by 10 per cent.

Stockholders of the Southern New England Telephone Company, at a meeting in New Haven, authorized an increase in capital stock from $10,000,000 to $15,000,000. Directors voted to offer to shareholders the right to subscribe to $1,000,000 of the increase, or one new for each ten old shares. Subscription price is $100 a share, and rights expire November 21.

George E. Hardy, J. C. Weadock and Jacob Heckma have incorporated the Northern Ohio Electrical Corporation with a capitalization of $6,375,000. This is the corporation which will take over approximately 95 per cent of the common stock of the Northern Ohio Traction & Light Company recently acquired at par by Hodenpyl, Hardy & Company of New York, and E. W. Clark & Company, of Philadelphia.

Chandler & Company, Incorporated, New York City and Philadelphia, announce that they have purchased from the Manhattan Electrical Supply Company $1,500,000 7-per-cent first-preferred stock. This is a new corporation formed to take over the entire assets and business of the present Manhattan Electrical Supply Company as a going concern. This company has been in business for a great many years, having started with a nominal capital of $1,300 and today conducts one of the most important businesses in its line in the United States. The new company will have net tangible assets greatly in excess of the issue of preferred stock and its net earning power is large. Its dividend record has been very

CLOSING BID PRICES FOR ELECTRICAL SECURITIES IN THE LEADING EXCHANGES AS COMPARED WITH THE PREVIOUS WEEK.

	Oct. 23.	Oct. 16.
American Tel. & Tel. (New York)	132⅞	132⅞
Commonwealth Edison (Chicago)	145	145
Edison Electric Illuminating (Boston)	234½	235
Electric Storage Battery, common (Philadelphia)	69½	71
Electric Storage Battery, preferred (Philadelphia)	69½	71
General Electric (New York)	184½	176
Kings County Electric (New York)	130	130
Massachusetts Electric, common (Boston)	5	5
Massachusetts Electric, preferred stamped (Boston)	34	34
National Carbon, common (Chicago)	246	—
National Carbon, preferred (Chicago)	—	123½
New England Telephone (Boston)	129¾	128¾
Philadelphia Electric (Philadelphia)	28¾	28¼
Postal Telegraph and Cables, common (New York)	86¼	85
Postal Telegraph and Cables, preferred (New York)	66½	67
Western Union (New York)	103½	100½
Westinghouse, common (New York)	63⅜	60½
Westinghouse preferred (New York)	70	73¾

consistent. The company manufactures the "Red Seal" dry battery and other electrical appliances. Business is carried on in New York, Chicago, Boston and St. Louis.

Dividends.

	Term	Rate	Payable
Am. Rys., pf.	Q	1.75%	Nov. 15
Automatic Elec.	Q	1 %	Nov. 1
Brazil Trac., Lt. & Pw., com.	Q	1 %	Dec. 1
Cin., Sandusky & Cleve'l'd.	Q	1.5 %	Nov. 1
Cities Service, com.	M.	0.5 %	Dec. 1
Cities Service, pf.	M.	0.5 %	Dec. 1
Cities Service, com.	S.tk.	4 %	Dec. 1
Colum. Pw. & Lt.	Q	1.25%	Nov. 1
Colum. Pw. & Lt., pf.	Q	1.25%	Nov. 1
Cum. Co. (Me.) Pw. & Lt., pf.	Q	1.5 %	Nov. 1
Edison Elec. Ill. of Brockton	Q	$2	Nov. 1
Ft. Worth Pw & Lt., pf.	Q	1.75%	Nov. 1
Grand Rapids Ry., pf.	Q	1.25%	Nov. 1
Havana Elec. Ry., Lt. & Pw., com.	S	3 %	Nov. 15
Havana Elec. Ry., Lt. & Pw., pf.	S	3 %	Nov. 15
Indianapolis Teleph'ne, pf	Q	1.5 %	Nov. 1
Kings Co. Elec. Lt. & Pw.	Q	2 %	Dec. 1
Lehigh Val. Transit, pf.	Q	1.25%	Nov. 10
Lewiston, A. & W. St. Ry., pf.	Q	1.5 %	Nov. 1
Lowell Elec. Ltg. Corp.	Q	$2.50	Nov. 1
Pacific Pw. & Lt., pf.	Q	1.75%	Nov. 1
Pacific Gas & El., first pf.	Q	$1.50	Nov. 15
Pacific Gas & El., orig. pf.	Q	$1.50	Nov. 15
Sierra Pacific Elec., pf.	Q	$1.00	Nov. 1
Texas Pw. & Lt., pf.	Q	1.75%	Nov. 1
United Elec. Sec., pf.	S	$3.50	Nov. 1

Reports of Earnings.

NEWPORT NEWS & HAMPTON RAILWAY, GAS & ELECTRIC.

	1916	1915
August gross	$ 100,877	$ 93,465
Net after taxes	45,669	42,634
Total income	46,006	43,290
Surplus after charges	26,250	23,415
Eight months' gross	678,628	592,176
Net after taxes	263,124	233,618
Total income	265,117	235,671
Surplus after charges	110,374	79,291

KINGS COUNTY ELECTRIC LIGHT & POWER.

The Kings County Electric Light & Power Company reports for the nine months ended September 30, 1916, compare as follows:

	1916	1915
Gross	$5,920,375	$4,949,149
Net after taxes and depreciation	1,620,432	1,550,851
Other income	50,447	47,305
Total income	1,670,879	1,598,156
Surplus after charges	1,096,325	950,079

New Publications

COAL.—Bulletin No. 89 of the Engineering Experiment Station of the University of Illinois is entitled "Specific Gravity Studies of Illinois Coal," by Merle L. Nebel. Studies have been conducted in the laboratory and in the field and the results are given, but no fixed value can be assigned. The practical uses of specific gravity are pointed out.

PASADENA REPORT.—The ninth annual report of the Pasadena (Cal.) Municipal Lighting Works Department for 1915-1916 shows increases in output and income, and a surplus after depreciation, taxes and interest are allowed for. All arc lamps for street lighting have been replaced by incandescent lamps. C. W. Koiner is general manager and electrical engineer.

INTERNATIONAL UNITS:—The Bureau of Standards Scientific Paper No. 292 is entitled "International System of Electric and Magnetic Units," by J. H. Dellinger. This paper considers also other proposed systems of units, and gives particular attention to the magnetic units and the confused ideas sometimes held in relation to them.

REMOTE CONTROL.—Scientific Paper No. 291 of the Bureau of Standards is entitled "A System of Remote Control for an Electrical Testing Laboratory," by P. G. Agnew, W. H. Stannard, and J. L. Fearing. This paper describes a system of remote control which was developed primarily for use in testing electrical measuring instruments. Small multiple-lever controllers, which may be operated in any one of several laboratory rooms, give complete control of the output of a group of motor-generator sets.

VARIABLE INDUCTOR. — Bureau of Standards Scientific Paper No. 290 is entitled "A Variable Self and Mutual Inductor," by H. B. Brooks and F. C. Weaver. It describes an instrument which consists of two pairs of fixed coils held in stationary hard-rubber disks between which a third disk carrying two coils is arranged to be rotated. The form and the spacing of the coils were determined so as to secure the following advantages: (1) high ratio of inductance to resistance; (2) scale divisions of uniform length reading directly in units of inductance; (3) astatic arrangement of the coils. Diagrams and data are given from which instruments of this type can be designed for given uses. Comparison is made of the new instrument and of some older forms.

New Incorporations

MARION, IND.—Delta Electric Company has increased its capital stock from $65,000 to $90,000.

LANSING, MICH.—Barker-Cole Electric Company has increased its capital stock from $10,000 to $40,000.

AUGUSTA, ME.—Utah Power & Light Company has increased its capital stock from $45,000,000 to $60,000,000.

COLUMBUS, O.—Portz Electric Company. Capital, $10,000. Incorporators: Adam Portz, E. E. Portz and others.

NEW YORK, N. Y.—Grand Electric Company. Capital, $5,000. Incorporators: B. Sterwick, M. Janiger and A. Schaftel.

CLEVELAND, O.—DeMooy Electric Company. Capital, $10,000. Incorporators: W. H. Luther, C. W. DeMooy and others.

HENRYETTA, OKLA. — Sharpe-French Electric & Machine Company. Capital, $5,000. Incorporators: J. H. Sharpe, C. S. Sharpe and E. H. French.

ALBANY, N. Y.—Interstate Electric Construction Corporation. Capital, $5,000. Incorporators: W. H. Crowley, J. J. O'Connor and W. R. Condon.

SALT LAKE CITY, UTAH.—Intermountain Sign System (Electric). Capital, $10,000. Incorporators: R. E. Holliday, A. C. Tomlinson and Murray Rock.

COLUMBUS, O.—Ohio River Power Company. Capital, $10,000. Incorporators: H. M. Daugherty, Frank Espy, R. L. Buffington, E. S. Browne and F. C. Morrison.

KANSAS CITY, MO.—C. A. Spaulding Electrical Company. Capital, $3,000. Do all kinds of electrical and mechanical construction work. Incorporators: W. L. Poynter, A. H. North and M. C. Spaulding.

NEW YORK, N. Y.—Electric Automobile Sales Corporation. Capital, $10,000. Incorporators: George Tiernan, Frank H. Purcell and John B. Purcell, all of 64 Wall Street.

ALBANY, N. Y.—Schroeder Electric Company. Capital, $10,000. Manufacture storage batteries, etc. Incorporators: J. F. Schroeder and S. M. Schroeder, of 13 Delaware Terrace, and A. A. Schroeder, 105 Schuyler Street.

NEW YORK, N. Y.—National Insulate Company. Capital, $50,000. Manufacture insulating material. Incorporators: Peter Meyer, 105 West 120th Street; I. S. Beck, Bronx, and S. S. Hamburger, 320 Broadway, New York City.

Electrical Patents Issued October 17, 1916

Prepared by Thomas Howe, Patent Attorney, 2 Rector Street, New York, N. Y.

1,201,229. **Fluid-Measuring Apparatus.** O. W. Anderson, Rasunda, Sweden. Electromechanical lock for rotary measuring vessel controlled by float in receiving vessel.

1,201,241. **Signal-Controlling Device.** J. Berg, New York, N. Y. Circuit-closure for alarm circuit, for mounting on window sill.

1,201,255. **Compression Rheostat.** E. L. Clark, assignor to National Carbon Co., Cleveland O. Has special structure for permitting passage of cooling fluid.

1,201,270. **Oscillating-Current Generator.** L. de Forest, assignor to De Forest Radio Telephone & Telegraph Co., New York, N. Y. Normally oscillating audion has three terminal elements with non-inductive resistance between two.

1,201,271. **Oscillating Audion.** L. de Forest, assignor to De Forest Radio Telephone & Telegraph Co. Arrangement of electrodes and vessels.

1,201,272. **Telegraph and Telephone Receiving System.** L. de Forest, assignor to De Forest Radio Telephone & Telegraph Co. Comprises an audion with means for eliminating the effect of inductive disturbances on it.

1,201,273. **Oscillation Generator.** L. de Forest, assignor to De Forest Telephone & Telegraph Co. An audion comprising grid electrodes, wing electrodes and a hot electrode.

1,201,295. **Insulator Support.** L. E. Hendee, Milwaukee, Wis. For spool insulators.

1,201,314. **Door-Controlled Electric Switch.** O. Kreter, San Antonio, Tex. Rotary snap-switch in lighting circuit controlled by opening and closing door to room.

1,201,321. **Trolley-Wire Guard.** W. D. McCausland, Pittsburgh, Pa. Swinging hinge plates normally inclose the wire.

1,201,325. **Insulator.** H. R. Markel, Columbus, O. Two-part, reversible cleat.

1,201,336. **Rear-End Signal for Street-Railway Cars and the Like.** A. W. O'Brien, Montreal, Quebec, Canada. Electrically operated visible and audible signal in connection with a pivoted semaphore.

1,201,343. **Telephone Transmitter.** S. C. Porter, assignor to Port-O-Phone Corporation, Esopus, N. Y. Has special structure of sound passage.

1,201,354. **Valve Grinder.** E. A. Sargent, Ramsey, N. J. Unitary structure comprising electric motor.

1,201,362. **Dental Engine Hand-Tool.** W. G. Shelton, New York, N. Y. Details of mounting and gearing of motor.

1,201,363. **Self-Contained Engine Hand-Tool.** W. G. Shelton. Has motor with control switch and driving coupling control for dental use.

1,201,365. **Dental Hand Engine.** W. G. Shelton. Arrangement of motor and gearing with ball bearings.

1,201,366. **Electric Switch.** W. G. Shelton. Foot controlled resistance switch for dental apparatus.

1,201,379. **Apparatus for the Production of Ozone.** J. Steynis, assignor to Steynis Ozone Co., New York, N. Y. Has removable, self-contained generators mounted in tubular openings.

1,201,380. **Apparatus for Producing Ozone.** J. Steynis, assignor to Steynis Ozone Co. Generator is in a dried-air chamber.

1,201,384. **Switch for Electric Circuit.** B. P. Swyers, assignor to Motors Lock Co. of America, Pittsburgh, Pa. Details of permutation switch.

1,201,390. **Automobile Lock.** G. A. Theobald, Boston, Mass. Locking pawl for operating lever is operated by an electromagnet to unlock the lever.

1,201,404. **Head-Lamp.** R. H. Welles, assignor to Badger Brass Co., Kenosha, Wis. Details of casing and reflector.

1,201,405. **Adjustable Lamp-Socket.** R. H. Welles, assignor to Badger Brass Mfg. Co. For focusing lamp in headlights, etc.

1,201,418. **End-Cell Switch.** J. W. Achard, Philadelphia, Pa. Has a contact comprising contact resistance laminations with means for adjusting their contact pressure for reducing the current and voltage at the point of rupture.

1,201,424. **End-Cell Switch.** C. Ambruster, Roslyn, Pa. Modification of above with lateral non-fusing contacts of low resistance.

1,201,455. **Telephone-Exchange System.** C. L. Goodrum, assignor to Western Electric Co., New York, N. Y. Automatic switch connects terminals of a subscriber's old and new numbers.

1,201,457. **Control Mechanism for Internal-Combustion Engines.** W. S. Guthrie, Terrell, Tex. Has control of fuel quantity and spark interconnected.

1,201,479 and 1,201,480. **Primary Battery.** E. McGall, assignor to New Jersey Patent Co., West Orange, N. J. First patent: details of structure and arrangement of positive and negative plates. Second patent: details of copper oxid element.

1,201,481. **Galvanic Battery.** E. McGall and M. D. Malcomson, assignors to New Jersey Patent Co. Composition of collodial gelatinous electrolyte.

1,201,482. **Automobile Signal.** E. C. McKenzie and J. P. Dever, Toledo, O. Special distribution and control of signal lamps.

1,201,491. **Electromagnetic Device.** W. C. Neahr, assignor to the Protective Signal

Mfg. Co., Denver, Colo. Structural details of electromagnet having transparent insulating casing.

1,201,494. Railway Signal System. G. P. O'Rourke, Minneapolis, Minn. Lamps along track are lighted for a certain distance in the front and rear of a car.

1,201,504. Code Impulse Signaling System. J. G. Roberts, assignor to Western Electric Co., New York, N. Y. Method employing combinations of two kinds of impulses produced by full and partial interruptions.

1,201,506. Device for Placing and Removing Electric-Light Bulbs. M. W. Rozelle and G. F. Birmingham, Kansas City, Mo. Structure of clamp on end of pole.

1,201,509. Police Alarm. S. F. Schooley, McAlester, Okla. Arrangement of circuits for lamp and drop signal.

1,201,512. Dynamoelectric Machine. D. E. Search, assignor to Allis-Chalmers Mfg. Co., Milwaukee, Wis. Manner of securing lead for collector ring on rotary member.

1,201,516. Lamp-Jack. C. H. Smith, assignor to Kellogg Switchboard & Supply Co., Chicago, Ill. For telephone switchboards.

1,201,526. Automatic Safety System for Electrolyzers. H. R. Swartley and L. Larsen, assignors to Davis Bournonville Co., Jersey City, N. J. Generation of gases stopped if current flows in wrong direction.

1,201,530. Vapor Electric Apparatus. P. H. Thomas, assignor to Cooper Hewitt Electric Co., Hoboken, N. J. A variable shunt secures stability of operation.

1,201,541. Method of Obtaining Titanic Oxid. L. E. Barton, assignor to Titanium Alloy Mfg. Co., New York, N. Y. Electrolytic method of obtaining from titaniferous-ferruginous material.

1,201,550. Flashlight. F. W. Brush, Winthrop, Mass. Tubular type of battery lamp.

1,201,564. Signal Mechanism for Vehicles. P. U. Daniel, assignor to International Automatic Appliance Co., Buffalo, N. Y. Governor-controlled "stop" and "slow" signal.

1,201,569. Telephone System. E. D. Fales, assignor to Automatic Electric Co., Chicago, Ill. Arrangement of automatic switch for connecting subscriber's lines with trunk.

1,201,585. Electropneumatic Organ Valve. R. H. Jones, assignor to Rudolph Wurlitzer Mfg. Co., North Tonawanda, N. Y. Electromagnetically operated primary valve.

1,201,600. Telephone Trunking System. T. G. Martin, assignor to Automatic Electric Co., Chicago, Ill. Connector switch for subscriber's lines and trunks.

1,201,603. Sliding Bow and Rotating Brush for Electrically Driven Vehicles. G. Meyer, Zurich, Switzerland. Trolley-pole base and connection.

1,201,607. Electric Furnace. I. Moscicki, Lemberg, Austria-Hungary. Has high-tension alternating-current flame rotating in magnetic field, for treatment of gases and vapors.

1,201,610. Protective System of Electrical Transmission Lines. N. C. Nicholson, Buffalo, N. Y. Arrangement of fuse and switch for shunting arcs.

1,201,611. Process for Manufacturing Metallic Filaments for Incandescent Electric Lamps and for Other Purposes. K. Nishimoto, Tokyo, Japan. Filament is of tungsten and thorium.

1,201,619. Apparatus for Controlling the Energy Supply for Peak Demands. K. A. Pauly, assignor to General Electric Co., Schenectady, N. Y. An auxiliary source of supply is controlled by an integrating meter.

1,201,621. Means for Synchronizing Telegraphic and Other Apparatus. L. M. Potts, assignor to A. McLanahan, Baltimore, Md. A member having a natural period of vibration has oscillations forced upon it by current impulses alternating in polarity.

1,201,633. Process of Making Magnetic Material. W. E. Rudder, assignor to General Electric Co. Iron is annealed by subjecting commercial product to high temperature to remove oxygen; for lowering hysteresis, preventing ageing and increasing permeability.

1,201,637. Electric Time-System. H. R. Sargent, assignor to General Electric Co. Electric clock-system, wherein the clocks are operated by electric current varying as a function of time.

1,201,639. Electric Meter. K. Schmiedel, assignor to General Electric Co. Induction type.

1,201,646. Protective Device. C. P. Steinmetz, assignor to General Electric Co. Lightning arrester.

1,201,652. Globe-Holder for Electric Lights. W. R. Tompkins, Seattle, Wash. Waterproof structure. (See cut.)

1,201,654. Lantern for Nautical Use. F. W. Wakefield, assignor to F. W. Wakefield Brass Co., Vermilion, O. Details of casing for battery lamp.

1,201,661. Protective Means for Alternating-Current Distribution Systems. E. B. Medmore, assignor to General Electric Co. Arrangement of reverse-current relays.

1,201,670. Illuminated Sign. R. K. Witz, Chicago, Ill. Details of casing.

1,201,671. Induction Furnace. J. R. Wyatt, assignor to Ajax Metal Co., Philadelphia, Pa. Special structure of metal channels and transformer for securing desired circulation of metal.

1,201,687. Current-Transformer Device. A. R. Bullock, assignor to H. C. Lee, Los Angeles, Cal. Details of mechanical rectifier.

1,201,702. Interrupter for Ringing Circuits. H. D. Currier, assignor to Kellogg

No. 1,201,652.—Globe-Holder for Electric Lights.

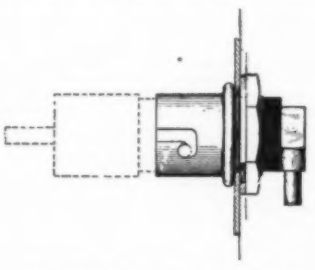
Switchboard & Supply Co., Chicago, Ill. For telephone systems.

1,201,707. Rheostat. G. H. Dorgeloh, assignor to General Electric Co. Has main and auxiliary electrodes, the latter immersed after resistance has been lowered.

1,201,709. Electric Cell. C. Fery, Paris, France. Special structure and arrangement of zinc and carbon electrodes of primary cells.

1,201,738. Method and Apparatus for Shaping Filaments. J. W. Janvier, assignor to General Electric Co., Schenectady, N. Y. For shaping a long looped filament of tungsten.

1,201,746. Lamp-Socket Fixture. F. A. Lavercombe, assignor to E. H. Freeman



No. 1,201,830.—Electric Socket.

Electric Co., Trenton, N. J. For attachment to a fixture nozzle.

1,201,762. Rear Signal. J. Reynolds, New York, N. Y. Comprises lamp and whistling apparatus.

1,201,771. Conduit Outlet Box and Fixture Therefor. E. G. Smith, assignor to Crouse Hinds Co., Syracuse, N. Y. Structural details.

1,201,782, 1,201,783 and 1,201,784. Electric Connector. E. E. Wilcox, Meriden, Conn. Details of plug and socket connections.

1,201,786. Sign. T. R. Willwerscheid, St. Paul, Minn. Automobile license plates, etc.

1,201,797. Telephone System. S. A. Beyland, assignor to Stromberg-Carlson Telephone Mfg. Co., Rochester, N. Y. Details of system having a reverting busy test with a distinctive signal.

1,201,809. Printing-Telegraph Receiver. A. F. Dixon, assignor to Western Electric Co. Special arrangement of operating electromagnets.

1,201,830. Electric Socket. G. C. Knauff, Chicago, Ill. For mounting in sign plates and the like. (See cut.)

1,201,837. Portable Means for Securing the Reverse Flow of Electric Currents. J. C. Lincoln, Cleveland, O. Comprises a dynamotor mounted on a car.

1,201,841. Display Apparatus. H. Mahieu, Jamaica, N. Y. Special arrangement of lamps.

1,201,858. Station-Indicator. W. Z. Musgrave, Chicago, Ill. For vehicles; details of electromagnetically operated mechanism.

1,201,869. Circuit-Controller. W. C. Reed, assignor to Telelectric Co., Pittsfield, Mass. Details of special contacting device.

1,201,880. Head-Lamp Control. O. R. Sell, Colorado Springs, Colo. Mechanism for adjusting lamp and headlight, etc.

1,201,909. Wire Splice and Lead-Line Connector. H. D. Zinn, E. R. Danser and L. D. Vaughn, assignors of one-half to L. D. Vaughn and one-half to W. P. Samples, Grafton, W. Va. For trolley wires.

1,201,918. Refillable Fuse-Cartridge. I. E. Barricklow, San Francisco, Cal. Structural details.

1,201,920. Sanitary Agitator for Drink Mixers. C. H. Beach, assignor to Wisconsin Electric Co., Racine, Wis. Mounting of motor.

1,201,921. Rheostat. C. H. Beach, assignor to Wisconsin Electric Co. Details of special structure for securing variable resistance; push-operated.

1,201,929. Method and Apparatus for Inductively Generating Heat in Applying Rail-Bonds and the Like. G. H. Bolus, assignor to Ohio Brass Co., Mansfield, O. Transformer apparatus for inducing heat at desired point by producing hysteresis, eddy currents, etc.

1,201,939. Battery Box. A. B. Cole, assignor to Manhattan Electrical Supply Co., New York, N. Y. Has contacts for securing proper connection of the cells.

1,201,955. Process for the Manufacture of the Sulfate, Sulfite, and Oxid Directly from the Sulfid of Lead. J. Gitsham, London, England. Is carried out in an electric furnace.

1,201,996. Electrical Measuring Instrument. G. Campos, Milan, Italy. Windings and connections of wattmeter.

1,202,006. Electro Amalgamating Machine. J. Ogden, Philadelphia, Pa. Arrangement of anodes and tank for treating ores in solution.

Reissue 14,204. Insulator. L. Steinberger, Brooklyn, N. Y. Original No. 927,157, dated July 6, 1909. Strain insulator.

PATENTS EXPIRED.

The following United States electrical patents expired October 24, 1916:

635,287. Terminal for Pole-Pieces of Accumulators. E. Andreas, Dresden, Germany.

635,319. Circuit-Controlling Device. J. Heinze, Jr., Revere, Mass.

635,353. Support for Railway-Switch Operating Wires and Conduits. F. J. Schmeiser, Bucyrus, O.

635,373. Electric Switch. L. W. Downes, Providence, and W. T. Sherman, Eden Park, R. I.

635,378. Coin-Controlled Call-Recording Device for Telephone Systems. J. B. Gill, San Francisco, Cal.

635,380. Electroplating Apparatus. B. E. Goodrich, New Britain, Conn.

635,395. Electric Cutout. J. Sachs, New York, N. Y.

635,396. Electric Switch. J. Sachs, New York, N. Y.

635,441. Resistance Box. H. W. Leonard, New York, N. Y.

635,446. Means for Generating Electricity from Car-Wheel Axles. M. Moskowitz, Newark, N. J.

635,447. Electric Incandescent Lamp. W. J. Phelps, Elmwood, Ill.

635,470. Protective or Guard Appliance. E. Frischmuth, Berlin, Germany.

635,485. Junction Box for Electrical Conductors. R. L. L. Hundhausen, Wilmersdorf, Germany.

635,489. Dynamoelectric Machine. N. J. Laschet, Darmstadt, Germany.

635,493. System of Calls and Signals. R. J. Louis, Chicago, Ill.

635,496. Reversing Switch for Electric Motors. E. V. Matlack, St. Louis, Mo.

635,506. Electric Igniter for Gas Engines. R. E. Olds, Lansing, Mich.

635,545 and 635,629. Electric Arc Lamp. F. S. Worsley, London, England.

635,637. Electrical Warp Stop-Motion for Looms. W. H. Baker, Central Falls, R. I., and F. E. Kip, Montclair, N. J.

635,681 Electrical Machine J. B. Hague, Horseheads, N. Y.

635,691. Electric Switch. C. J. Klein, New York, N. Y.

635,699. Arc-Lamp Hanger. G. E. McCormac and S. J. Lapthorne, St. Joseph, Mo.